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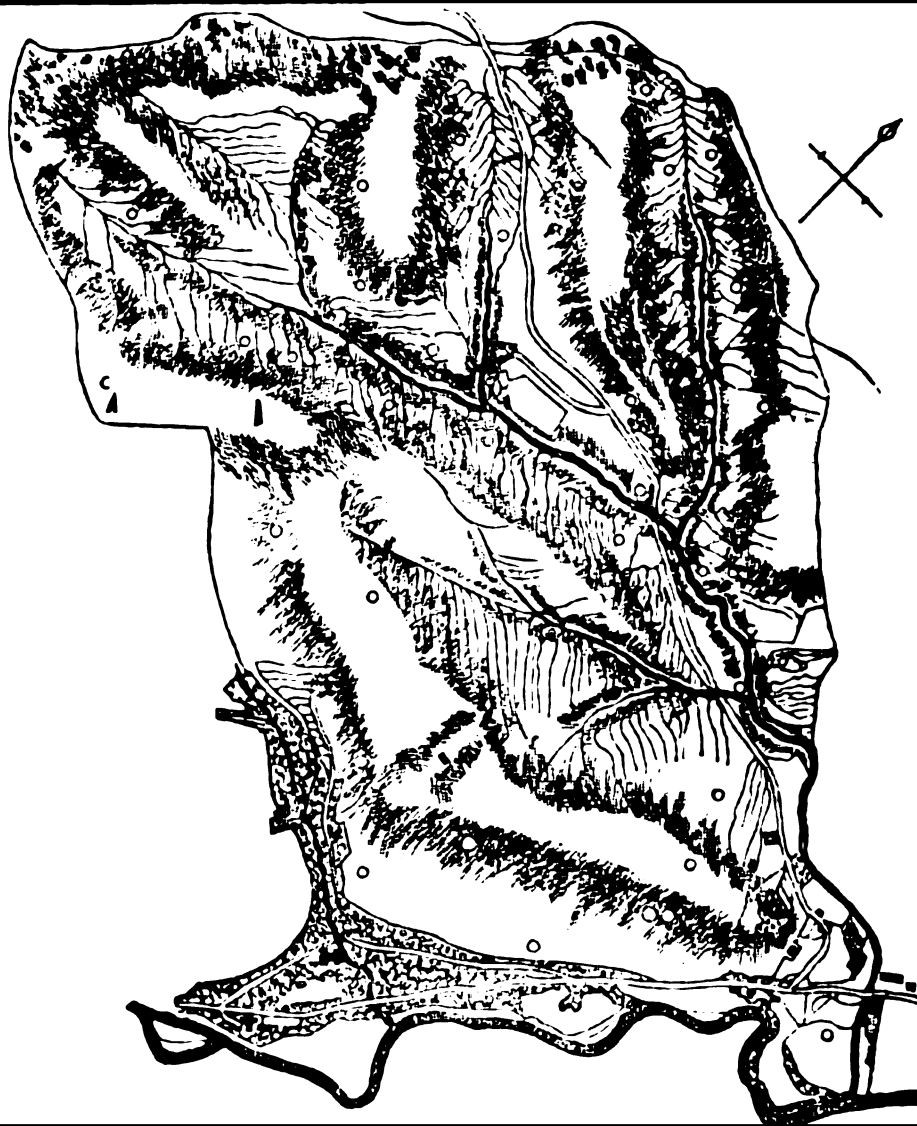
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*An Encyclopædia of
Agriculture*

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BOOK III.

OF IMPROVING THE CULTURABLE LANDS OF AN ESTATE.

3908. HAVING completed the general arrangement of an estate, the next thing is to improve the condition of that part of it destined to be let out to tenants, and from which, as already observed, the chief source of income is derived. The farm lands being enclosed and subdivided, and the farmeries and cottages built in their proper situations, in many cases no other improvements are wanted on the soil than such as are given by the tenant in the ordinary course of culture. But there are also numerous cases, in which improvements are required which could not be expected from an occupier having only a temporary interest in his possession; and these form the present subject of discussion. Such improvements are designated by agriculturists *permanent*, as conferring an increased purchasable value on the property, in opposition to improvements by a temporary occupier, the benefits of which are intended to be reaped during his lease. The latter class of improvements include fallows, liming, marling, manuring, improved rotations, and others of greater expense, according to the length of lease, rent, and encouragement given by the landlord; the former, and which we are now about to discuss, include draining, embanking, irrigating, bringing waste lands into cultivation, and improving the condition of lands already in a state of culture.

CHAP. I.

Of Draining Watery Lands.

3909. *Draining* is one of those means of improvement, respecting the utility of which agriculturists are unanimous in opinion. Though practised by the Romans (143.), and in all probability in some cases by the religious fraternities of the dark ages, it was not till after the middle of the last century that its importance began to be fully understood in Britain; and that some individuals, and chiefly Dr. Anderson and Elkington, began to practise it on new principles. About the same time, the study of geology became more general, and this circumstance led to the establishment of the art on scientific principles. The public attention was first excited by the practice of Elkington, a farmer and self-taught professor of the art of draining in Warwickshire and the adjoining counties. On the practice of this artist most of the future improvements have been founded; and they have been ably embodied in the account of his practice by Johnston, from whose work we shall draw the principal materials of this section, borrowing also from the writings of Dr. Anderson, Marshal, Smith, Farey, and some others on the same subject. After submitting some general remarks on the natural causes of wetness in lands, we shall consider in succession the drainage of boggy lands, hilly lands, mixed soils, retentive soils, and mines and quarries; and then the kinds of drains, and draining materials.

SECT. I. *Of the Natural Causes of Wetness in Lands, and the general Theory of Draining.*

3910. The successful practice of draining in a great measure depends on a proper knowledge of the structure of the earth's upper crust; that is, of the various strata of which it is composed, as well as of their relative degrees of porosity, or capability of admitting or rejecting the passage of water through them, and likewise the modes in which water is formed, and conducted from the high or hilly situations to the low or level grounds. In whatever way the hills or elevations that present themselves on the surface of the globe were originally formed, it has been clearly shown, by sinking large pits, and digging into them, that they are mostly composed of materials lying in a stratified order, and in oblique or slanting directions downwards. Some of these strata, from their nature and properties, are capable of admitting water to percolate or pass through them; while others do not allow it any passage, but force it to run or filtrate along their surfaces without penetrating them in any degree, and in that way to conduct it to the more level grounds below. There it becomes obstructed or dammed up by meeting with impervious materials of some kind or other, by which it is readily forced up into the super-incumbent layers where they happen to be open and porous, soon rendering them too wet for the purposes of agriculture; but where they are of a more tenacious and impenetrable quality, they only become gradually softened by the stagnant water below them; by which the surface of the ground is, however, rendered equally moist and swampy, though somewhat more slowly than in the former case. It may also be observed, that some of the strata which constitute such hilly or mountainous tracts are found to be continued with much greater

regularity than others ; those which are placed nearest to the surface at the inferior parts of such hills or elevations, being mostly broken or interrupted before they reach the tops or higher parts of them ; while those which lie deeper, or below them at the bottom, show themselves in these elevated situations. Thus, that stratum which may lie the third or fourth, or still deeper, at the commencement of the valley may form the uppermost layer on the summits of hills or mountainous elevations. This arrangement or distribution of the different strata may have been produced partly by the circumstances attending the original elevation of such mountainous regions, and partly from the materials of the original exterior strata being dissolved and carried down into the valleys by successive rains and other causes, and thus leaving such as were immediately below them in an exposed and superficial state in these elevated situations. (*Darwin's Phytologia*, p. 258.)

3911. *These elevated strata frequently prove the means of rendering the grounds below wet and swampy* ; for, from the night dews, and the general moisture of the atmosphere, being condensed in much greater quantities in such elevated situations, the water thus formed, as well as that which falls in rain and sinks through the superficial porous materials, readily insinuate themselves, and thus pass along between the first and second, or still more inferior strata which compose the sides of such elevations ; until their descent is retarded or totally obstructed by some impenetrable substance, such as clay ; it there becomes dammed up, and ultimately forced to filtrate slowly over it, or to rise to some part of the surface, and constitute, according to the particular circumstances of the case, different watery appearances in the grounds below. These appearances are, oozing springs, bogs, swamps, or morasses, weeping rocks from the water slowly issuing in various places, or a large spring or rivulet from the union of small currents beneath the ground. This is obvious from the sudden disappearance of moisture on some parts of lands, while it stagnates, or remains till removed by the effects of evaporation on others ; as well as from the force of springs being stronger in wet than dry weather, breaking out frequently after the land has been impregnated with much moisture in higher situations, and as the season becomes drier ceasing to flow, except at the lowest outlets. The force of springs, or proportion of water which they send forth, depends likewise, in a great measure, on the extent of the high ground on which the moisture is received and detained, furnishing extensive reservoirs or collections of water, by which they become more amply and regularly supplied. On this account, what are termed bog-springs, or such as rise in valleys and low grounds, are considerably stronger and more regular in their discharge, than such as burst forth on the more elevated situations or the sides of eminences. (*Johnston's Account of Elkington's Mode of Draining Land*, p. 15.)

3912. *The waters condensed on elevated regions* are sometimes found to descend, for a very considerable distance, among the porous substances between the different conducting layers of clayey or other materials, before they break out or show themselves in the grounds below ; but it is more frequently the case to find them proceeding from the contiguous elevations into the low grounds that immediately surround them.

3913. *The nature of the stratum of materials on which the water proceeding from hills has to penetrate*, must considerably influence its course, as well as the effects which it may produce on such lands as lie below, and into which it must pass. Where it is of the clayey, stiff marly, or impervious rocky kinds, and not interrupted or broken by any other kind of materials of a more porous quality, it may pass on to a much greater distance, than where the stratum has been frequently broken and filled up with loose porous materials, in which it will be detained, and of course rise up to the surface.

3914. *These sorts of strata extend to very different depths in different situations and districts*, as has been frequently noticed in the digging of pits, and the sinking of deep wells, and other subterraneous cavities. The clayey strata are, however, in general found to be more superficial than those of the compact, tenacious, marly kinds, or even those of a firm, uninterrupted, rocky nature, and seldom of such a great thickness ; they have, nevertheless, been observed to vary greatly in this respect, being met with in some places of a considerable thickness, while in others they scarcely exceed a few inches.

3915. *The intervening porous substances*, or strata where clay prevails, are found, for the most part, to be of either a gravelly or loose rocky nature. Stiff marly strata, which approach much to the quality of clay, though in some instances they may present themselves near the surface, in general lie concealed at considerable depths under the true clayey strata, and other layers of earthy or other materials ; they have been discovered of various thicknesses, from eight or ten feet to considerably more than a hundred. (*Darwin's Phytologia*, p. 259.) The intervening materials, where strata of this nature are predominant, are most commonly of the more sandy kinds ; possessing various degrees of induration, so as in some cases to become perfectly hard and rocky, but with frequent breaks or fissures passing through them. The loose, friable, marly strata are capable of absorbing water, and of admitting it to filtrate and pass through them.

3916. *Thus the valleys and more level grounds must constantly be liable to be overcharged with moisture* ; and to become, in consequence, spouty, boggy, or of the nature of a morass,

accordingly as they may be circumstanced in respect to their situation, the nature of their soils, or the materials by which the water is obstructed and detained in or upon them.

3917. *Where lands have a sufficient degree of elevation to admit of any over-proportion of moisture readily passing away, and where the soils of them are of such an uniform sandy or gravelly and uninterrupted texture, as to allow water to percolate and pass through them with facility, they can be little inconvenienced by water coming upon or into them, as it must of necessity be quickly conveyed away into the adjacent rivers or small runlets in their vicinity.*

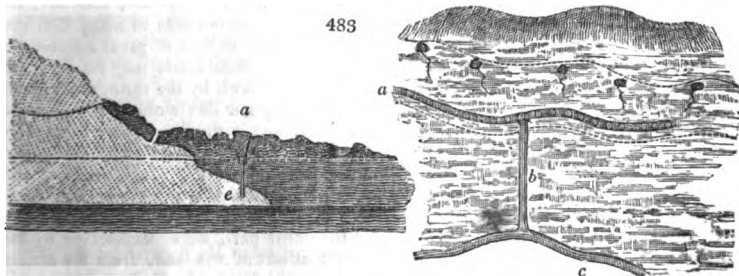
3918. *But where grounds are in a great measure flat, and without such degrees of elevation as may be sufficient to permit those over-proportions of moisture that may have come upon them from the higher and more elevated grounds, to pass readily away and be carried off, and where the soils of the lands are composed or constituted of such materials as are liable to admit and retain the excesses of moisture; they must be exposed to much injury and inconvenience from the retention and stagnation of such quantities of water. Such lands consequently require artificial means to drain and render them capable of affording good crops, whether of grain or grass.*

3919. *Lands of valleys and other low places, as well as, in some cases, the level tracts on the sides or borders of large rivers and of the sea, must also frequently be subject to great injury and inconvenience from their imbibing and retaining the water that may be thus forced to flow up into or upon them, either through the different conducting strata from the hills and mountainous elevations in the neighborhood, or the porous materials of the soils. In these ways they may be rendered swampy, and have bogs or morasses produced in them in proportion to the predominancy of the materials by which the water is absorbed and dammed up, and the peculiarity of the situation of the lands in respect to the means of conveying it away.*

3920. *To perform properly the business of draining, attention should not only be paid to the discrimination of the differences in regard to the situation of the lands, or what is commonly denominated drainage level; but also to the nature, distribution, and depth of the materials that constitute the soils or more superficial parts of them, as upon each of these some variety, in respect to the effects arising from water retained in them, may depend.*

3921. *Wetness of land, so far as it respects agriculture, and is an object of draining, may generally depend on the two following causes: first, on the water which is formed and collected on or in the hills or higher grounds, filtrating and sliding down among some of the different beds of porous materials that lie immediately upon the impervious strata, forming springs below and flowing over the surface, or stagnating underneath it; and secondly, on rain or other water becoming stagnant on the surface, from the retentive nature of the soil or surface materials, and the particular nature of the situation of the ground. The particular wetness which shows itself in different situations, in the forms of bogs, swamps, and morasses, for the most part proceeds from the first of these causes; but that superficial wetness which takes place in the stiff, tenacious, clayey soils, with little inclination of surface, generally originates from the latter.*

3922. *The most certain and expeditious method of draining, in such cases, is that of intercepting the descent of the water or spring, and thereby totally removing the cause of wetness. This may be done where the depth of the superficial strata, and consequently of the spring, is not great; by making horizontal drains (fig. 483 a) of consi-*



derable length across the declivities of the hills, about where the low grounds of the valleys begin to form, and connecting these with others (b) made for the purpose of conveying the water thus collected into the brooks or runlets (c) that may be near. Where the spring has naturally formed itself an outlet, it may frequently only be necessary to bore into it (c) or render it larger, and of more depth; which, by affording the water a more free and open passage, may evacuate and bring it off more quickly, or sink it to a level so greatly below that of the surface of the soil, as to prevent it from flowing into or over it.

3923. *Where the uppermost stratum is so extremely thick as not to be easily penetrated, or where the springs, formed by the water passing from the higher grounds, may be confined beneath the third or fourth strata of the materials that form the declivities of hills or elevated grounds, and by this means lie too deep to be penetrated to by the cutting of a ditch, or even by boring (Darwin's *Phytologia*, p. 263.); the common mode of cutting a great number of drains to the depth of five, six, or more feet, across the wet morassy grounds, and afterwards covering them in such a manner as that the water may suffer no interruption in passing away through them, may be practised with advantage, as much of the prejudicial excess of moisture may by this means be collected and carried away, though not so completely as by fully cutting off the spring.*

3924. *As water is sometimes found upon thin layers of clay, which have underneath them sand, stone, or other porous or fissured strata, to a considerable depth; by perforating these thin layers of clay in different places, the water which flows along them may frequently be let down into the open porous materials that lie below them, and the surface land be thus completely drained.*

3925. *Where morasses and other kinds of wetnesses are formed in such low places and hollows as are considerably below the beds of the neighboring rivers, they may, probably, in many instances, be effectually drained by arresting the water as it passes down into them from the higher grounds, by means of deep drains cut into the sides of such hills and rising grounds, and, after collecting it into them, conveying it away by pipes, or other contrivances, at such high levels above the wet lands as may be necessary: or where the water that produces the mischief can by means of drains, cut in the wet ground itself, be so collected as to be capable of being raised by means of machinery, it may in that way be removed from the land.*

3926. *The drainage of lands that lie below the level of the sea, can only be effected by the public, and by means of locks erected for the purpose of preventing the entrance of the tides, and by wind-mills and other expensive kinds of machinery constructed for the purpose of raising the stagnant water.*

3927. *The superficial wetness of lands, which arises from the stiff retentive nature of the materials that constitute the soils and the particular circumstances of their situations, is to be removed in most cases by means of hollow surface drains, judiciously formed, either by the spade or plough, and filled up with suitable materials where the lands are under the grass system; and by these means and the proper construction of ridges and furrows where they are in a state of arable cultivation.*

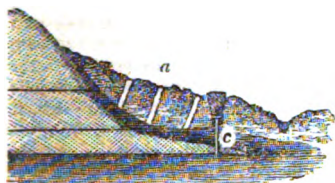
3928. *Having thus explained the manner in which soils are rendered too wet for the purposes of agriculture, and shown the principles on which the over-proportions of moisture may, under different circumstances, be the most effectually removed, we shall proceed to the practical methods which are to be made use of in accomplishing the business in each case.*

SECT. II. *Of the Methods of Draining Boggy Land.*

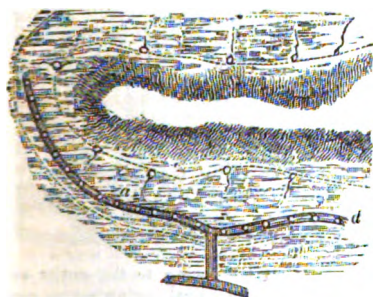
3929. *In the drainage of wet or boggy grounds, arising from springs of water beneath them, a great variety of circumstances are necessary to be kept in view. Lands of this description, or such as are of a marshy and boggy nature, from the detention of water beneath the spongy surface materials of which they are composed, and its being absorbed and forced up into them, are constantly kept in such states of wetness as are highly improper for the purpose of producing advantageous crops of any kind. They are, therefore, on this account, as well as those of their occupying very extensive tracts in many districts, and being, when properly reclaimed, of considerable value, objects of great interest and importance to the attentive agriculturist. Wet grounds of these kinds may be arranged under three distinct heads: first, such as may be readily known by the springs rising out of the adjacent more elevated ground, in an exact or regular line along the higher side of the wet surface; second, those in which the numerous springs that show themselves are not kept to any exact or regular line of direction along the higher or more elevated parts of the land, but break forth promiscuously throughout the whole surface, and particularly towards the inferior parts (fig. 484 a), constituting shaking quags in every direction, that have an elastic feel under the feet, on which the lightest animals can scarcely tread without danger, and which, for the most part, show themselves by the luxuriance and verdure of the grass about them; that sort of wet land, from the oozing of springs, which is neither of such great extent, nor in the nature of the soil so peaty as the other two, and to which the term bog cannot be strictly applied, but which in respect to the modes of draining is the same. (Johnston's *Account of Elkington's Mode of Draining Land*, p. 19.)*

3930. *In order to direct the proper mode of cutting the drains or trenches in draining lands of this sort, it will be necessary for the draining engineer to make himself perfectly acquainted with the nature and disposition of the strata composing the higher grounds, and the connection which they have with that which is to be rendered dry. This may in*

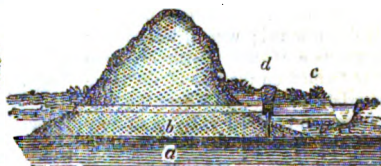
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general be accomplished by means of levelling and carefully attending to what has been already observed respecting the formation of hills and elevated grounds, and by inspecting the beds of rivers, the edges of banks that have been wrought through, and such pits and quarries as may have been dug near to the land. Rushes, alder-bushes, and other coarse aquatic plants, may also, in some instances, serve as guides in this business; but they should not be too implicitly depended on, as they may be caused by the stagnation of rain-water upon the surface, without any spring being present. The line of springs being ascertained, and also some knowledge of the substrata, a line of drain (fig. 484 b, d) should be marked out above or below them, according to the nature of the strata, and excavated to such a depth as will intercept the water in the porous strata before it rises to the surface. The effect of such drains will often be greatly heightened by boring holes (c) in their bottom with the auger. Where the impervious stratum (fig. 485 a), that



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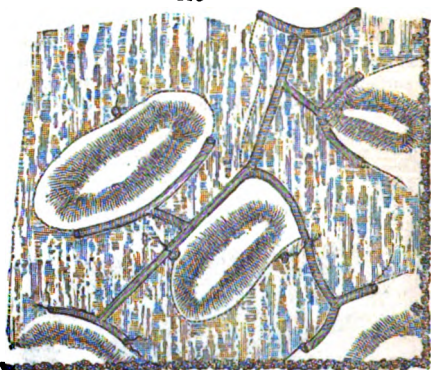
lies immediately beneath the porous (b), has a slanting direction through a hill or rising bank, the surface of the low lands will, in general, be spongy, wet, and covered with rushes on every side (c). In this case, which is not unfrequent, a ditch or drain (d), properly cut on one side of the hill or rising ground, may remove the wetness from both. But where the impervious stratum dips or declines more to one side of the hill as elevation than the other, the water will be directed to the more depressed side of that stratum; the effect of which will be, that one side of such rising ground will be wet and spongy, while the other is quite free from wetness.

3931. Where water issues forth on the surface at more places than one, it is necessary to determine which is the real or principal spring, and that from which the other outlets are fed; as by removing the source, the others must of course be rendered dry. When on the declivity or slanting surface of the elevated ground from which the springs break forth, they are observed to burst out at different levels according to the difference of the wetness of the season, and where those that are the lowest down continue to run, while the higher ones are dry, it is, in general, a certain indication that the whole are connected, and proceed from the same source; and consequently that the line of the drain should be made along the level of the lowermost one, which, if properly executed, must keep all the others dry. But if the drain was made along the line of the highest of the outlets, or places where the water breaks forth, without being sufficiently deep to reach the level of those below, the overflowings of the spring would merely be carried away, and the wetness proceeding from that cause be removed; while the main spring, still continuing to run, would render the land below the level of the bottom of the drain still prejudiciously wet, from its discharging itself lower down over the surface of the ground. This, Johnston states, was the custom, until Elkington showed the absurdity of the practice of drainers beginning to cut their trenches wherever the highest springs showed themselves between the wet and the dry ground, which not being of a depth sufficient to arrest and take away the whole of the water, others of a similar kind were under the

necessity of being formed at different distances, to the very bottom of the declivity : these being afterwards in a great measure filled with loose stones, merely conveyed away portions of surface water, without touching the spring, the great or principal cause of the wetness. The effects of drains formed in this manner he asserts to be, that of rendering the surface of the land in some degree drier, so long as they continue to run with freedom ; but as they are liable soon to be obstructed and filled up by sand or other materials, the water is often forced out in different places and directions, and thus renders the land equally wet, if not more so, than it was before. In addition to this, it is a more difficult task to drain the ground a second time in a proper method, from the natural appearance of the ground being so much changed, and the bursts of the old drains, as well as the greater difficulty of ascertaining the real situation of the springs.

3932. It may sometimes happen, however, that where the highest are the strongest outlets, they may be the main or leading springs; those which show themselves lower down in the land being merely formed by the water of the main spring overflowing, and finding itself a passage from an opening, or the porous nature of the materials of the soil near to the surface, and from being obstructed somewhat further down in the ground by some impervious stratum. This circumstance must, therefore, it is observed, be fully ascertained before the lines for the ditches or drains are marked out.

3933. In cases where the banks or rising grounds are formed in an irregular manner (fig. 486.), and from the nature of the situation, or the force of the water underneath, springs abound round the bases of the protuberances, the ditches made for the purpose of draining should always be carried up to a much higher level in the side of the elevated ground than that in which the water or wetness appears; as far even as to the firm unchanged land. By this means the water of the spring may be cut off, and the ground completely drained; which would not be the case if the trench or drain were formed on the line of the loose materials lower down where the water oozes out, which is liable to mislead the operator in forming the conducting trench, or that which is



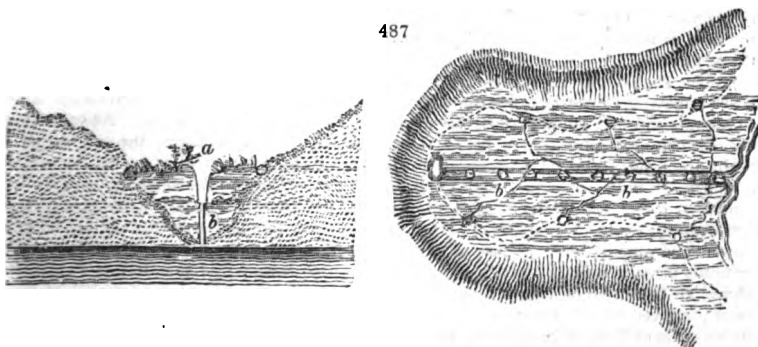
to convey the water from the cross-drain on the level of the spring to the outlet or opening by which it is discharged. But where the main or principal spring comes out of a perpendicular or very steep bank, at a great height above the level of the outlet into which it may discharge itself by means of a drain; it will neither be necessary nor of any utility to form a deep trench, or make a covered drain, all the way from such outlet up to it; as from the steepness of the descent the water would be liable, when the drain was thus cut, from the thin strata of sand, and other loose materials, always found in such cases, to insinuate itself under the bricks, stones, or other substances of which the drain was formed; to undermine and force them up by the strength of the current, or, probably, in some instances, block the drain up by the loose sand or other matters, which may be forced away and carried down by it. In situations of this kind, Johnston observes, it is always the best way to begin just so far down the bank or declivity as, by cutting in a level, the drain may be six or seven feet below the level of the spring; or of such a depth as may be requisite to bring down the water to a level suitable to convey it away without its rising to the surface, and injuring the lands around it. The rest of the drain, whether it be made in a straight or oblique direction, need not be deep, and may, in many instances, be left quite open; it should, however, be carefully secured from the treading of cattle, and, where the land is under an arable system of cultivation, also from the plough. Where it is covered, the depth of about two feet may be sufficient. There will not, in such drains, be any necessity for the use of the auger in any part of them.

3934. Where there is a difficulty in ascertaining the line of the spring, and consequently that of the cross drain, either from its not showing itself on the surface, or from there not being any apparent outlet, it may, generally, be met with in carrying up the conducting drain for conveying away the water: as soon as the operator discovers the spring, he need not proceed any further, but form the cross drain on the level thus discovered to such a distance on each side of the tail, or terminating part of the strata, of whatever sort, that contains the water, as the nature of the land, in regard to situation or other circumstances, may demand. Where, in forming a cross-drain, the line indicated by the spirit or

other level is found to be in some places below that of the spring, and where, in boring in this direction, water is not found to follow, it will be necessary to make short drains or cuts of the same depth with the cross-drain, from it quite up to the source of the spring; for, if the drain be cut below the line of the spring, the possibility of reaching it by means of an auger is lost, as where the under stratum is clay, and there is no under water, the use of the auger cannot be effectual; and if it be made above the line of the spring, it will be requisite to cut and bore much deeper, in order to reach it, the ground being in general higher in that part: besides, the portion of porous stratum below the drain may contain a sufficient quantity of water to render the land wet, and that may readily get down underneath the trench, between the holes formed by boring, and break out lower down.

3935. In situations *where the extent of bog in the valley between two banks or eminences is so narrow and limited as that the stratum of rock, sand, or other materials that contains the water, may unite below the clay at such a depth as to be readily reached by the auger (fig. 487 a), it will seldom be necessary to have more than one trench up the middle,*

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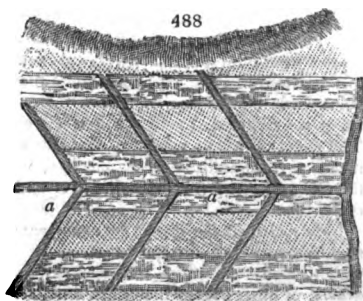
well perforated with holes (b) by means of the auger; cross or branching drains being unnecessary in such cases. For notwithstanding the springs, that render the land injuriously wet in these cases, burst out of the banks or eminences on every side, for the most part nearly on the same level, the reservoir from which they proceed may be discovered in the middle of the valley, by penetrating with the auger through the layer of clay, that confines and forces the water to rise up and ooze out round the superior edge of it, where it forms an union with the high porous ground. From the drain being made in the hollowest part of the land, and the porous stratum containing the water being then bored into, it is obvious that the ditch or drain thus formed being so much lower than the ordinary outlet of the springs, the pressure of water above that level, which is the bottom of the drain, must be such as to force that which is under the drain or trench through the holes made by the auger, and in many instances, until a considerable quantity of the water is evacuated, make it rise to a greater height than the level of its natural outlet. The effect of which must be, that the water forming the spring, having found by these means a fresh and more easy passage, will quickly relinquish its former openings, and thus be prevented from running over and injuring the ground, that previously lay lower down than it.

3936. But in *swamps or bogs that are extensive and very wet*, other drains or cuts than such as convey off the springs must be made; as, notwithstanding the higher springs which chiefly cause the wetness may be intercepted, there may be lower veins of sand, gravel, or other porous materials, from which the water must likewise be drawn off. In cases of this nature, where the land is to be divided into enclosures, the ditches may be formed in such directions as to pass through and carry off collections of water of this kind, as well as those that may be retained in the hollows and depressions on the surface of the land. There are in many places very extensive tracts of ground that are rendered wet, and become full of rushes and other coarse plants, from causes of such a nature as cannot be obviated by the making of either open or covered drains, however numerous they may be. Lands in this situation are frequently termed holms, and mostly lie on the sides of such rivers and brooks as, from the frequency of their changing and altering their courses between their opposite banks, leave depositions of sand, gravel, and other porous materials, by which land is formed, that readily admits the water to filtrate and pass through it to the level of the last-formed channels, and which preserves it constantly in such a state of moisture and wetness, as to render it productive of nothing but rushes and other aquatic plants; and if a pit or ditch be made in lands under these circumstances, it quickly fills with water to the same level as that in the watercourse. This effect is, however, more liable to be produced, as well as more complete, where the current of the

water is slow, and its surface nearly equal with that of the land, than where its descent is rapid. Under such circumstances, while the river or brook remains at the ordinary height, no advantage can be gained, whatever number of drains be formed, or in whatever direction they may be made. The chief or only means of removing the wetness of land proceeding from this cause is, that of enlarging and sinking the bed of the stream, where it can be effected at a reasonable expense: where there is only one stream, and it is very winding or serpentine in its course, much may however be effected by cutting through the different points of land, and rendering the course more straight, and thereby less liable to obstruct the passage of the water. But in cases where there are more than one, that should always be made the channel of conveyance for draining the neighboring land, which is the lowest in respect to situation and the most open and straight in its course. It may likewise, in particular instances, be advantageous to stop up and divert the waters of the others into such main channels, as by such means alone they may often be rendered deeper, and more free from obstruction: the materials removed from them may serve to embank and raise up the sides to a greater height, as while the water can rise higher than the outlets of the drains, and flow backwards into them, it must render the land as wet as it was before they were formed, and the expense of cutting them be thrown away.

3937. *The collected rain-water becoming stagnant on a retentive body of clay, or some other impervious material, as it can have no outlet of the natural kind, causes such lands to become soft and spongy, thus forming bogs of a very confined kind. As such bogs are often situated very greatly below the ground that surrounds them, the opening of a main drain, or conductor, to convey off the water collected by smaller drains, would be attended, in many instances, with an expense greater than could be compensated by the land after it had been drained. The thickness of the impervious stratum that retains and keeps up the water in such cases is often so great, that though the stratum below be of a porous and open nature, such as sand, rock, or gravel, the water cannot of itself penetrate or find a passage from the one into the other; consequently, by its continued stagnation above, all the different coarse vegetable productions that have for a great length of time been produced on its surface, and probably the upper part of the soil itself, are formed into a mass or body of peat earth, equally soft and less productive than that of any bog originating from water confined below, and which is only capable of sustaining the weight of cattle in very dry seasons, when the wind and sun have exhaled and dried up a great part of its surface moisture; but even then it is incapable of admitting the plough upon it.*

3938. *As the cause of these kinds of bogs is materially different from that of those which have been already noticed, their drainage must of course be accomplished in a different way. The following method of proceeding is recommended as perhaps the least expensive. In the middle, or most depending part of the ground, the first drain (fig. 488 a), may be cut, into which all the others should be made to lead; the number and direction of which must be regulated by the extent of the bog. They should be cut through the peat, or moist spongy upper soil, to the surface of the clay, or other retentive stratum of materials, which must then be perforated or bored through in order to let the water down into the pervious stratum below, by which it may be absorbed and taken up. The same effect might be produced by forming one large well, or pit, in the middle or lowest part of the bog, by digging through into the porous stratum below, and connecting the other drains with it, as by such a method the trouble and expense of boring along the drains would be saved. In these cases, when drains are made, they should always be cut as narrow as it is possible to make them, and after the holes have been formed in them by boring, filled up with loose stones to within about a foot and a half of the surface, which space may be made up by a portion of the earth that had been taken out, putting in turf with the green side to the stones before the earth is thrown in. By this means the water and prejudicial moisture of the peat, or upper soil, may be taken away by the drains, and pass off through the holes that have been formed in their bottoms. But where pits are employed, these should only be filled with small stones to the level of the bottom of the drain, the filling being performed as soon as possible after they are formed (*Anderson's Treatise on Draining*, p. 88.); where there is a chalky stratum below, after taking it out, the flints contained in it may be made use of in this way with much advantage; and where the drains can be carried into quarries, where the stone is much fissured, nothing more will be necessary. Where land of this sort is afterwards to be ploughed, great attention should be*



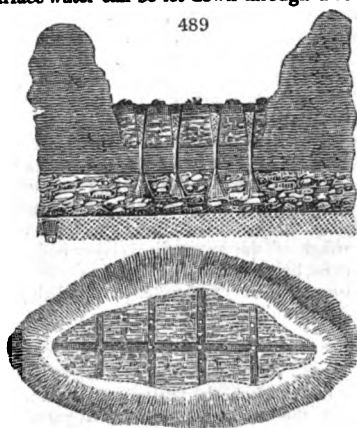
given to the forming of the ridges and giving them a regular descent towards themain drain, which will contribute greatly to the assistance of the others in conveying off heavy falls of rain-water when they occur.

3939. But a *necessary precaution* previous to any attempt to drain lands of this kind in the way that has been described, is to ascertain whether the porous stratum under the clay be dry, and capable of receiving the water when let down into it; or already so loaded with moisture itself, as, instead of receiving more from above, to force up a large quantity to the surface, and thus increase the evil it was intended to remove. This may be the case in many instances, and the substratum contain water which affords no appearances of wetness on the surface, at the place, on account of the compact body of clay that is placed over it, but which, from its being connected with some spring that is higher, may flow up when an opening or passage is given it, either by means of a pit or the auger. In this way a greater quantity of water might be brought to the surface, which, from its being confined by the surrounding banks, would render the ground much more wet than before, and in particular situations produce very great degrees of wetness. When the surrounding high ground declines lower than the bog, though it may be at a considerable distance, by the aid of the level, and the appearance of the surface, the nature of the stratum underneath may, in some degree, be ascertained; and, notwithstanding it may already contain water, a drain may be formed into it to carry off that water, and what may likewise be let down into it from the retentive stratum that lies above it. It must be confessed, however, that cases where surface water can be let down through a retentive stratum to a porous one that will actually carry it off, are very rare. When these occur, it is chiefly in limestone or coaly districts, where the surface is hilly or rugged (fig. 489.), and more calculated for the pursuits of the mineralogist than the agricultor.

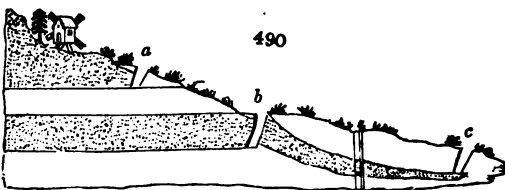
3940. *Draining hilly lands* is not in general attended with great expense, as the drains need seldom be covered or filled up, only in such places as may be sufficient for passages for the animals to cross by. And though, where the depth of the trench does not come to the water confined below, it may be necessary to perforate lower, there need not be any fear that the holes will fill up, even where the drain is left open; as the impetuosity of the water itself, will remove any sand or mud that may fall into them, where much flood or surface water does not get in. Small openings may, however, be made along the upper side of the trench, in order the more effectually to secure them against any obstructions; and in these the perforations may be made, leaving the mouth of the holes about six inches higher than the bottom of the drain, which will be without the reach of the water that may be collected during the time of heavy rains.

3941. *The sides or declivities of many hills*, from the irregularity of the disposition of the strata that compose them, are often covered with alternate portions or patches of wet and dry ground. By the general appearance of the surface and the vegetable products that are grown upon it, the nature and direction of the internal strata may frequently be ascertained with so much certainty as to determine the line or direction of a drain without the necessity of examining below the surface of the land. As the ease or difficulty of draining such grounds depends solely on the position of the different strata of which the hill or elevation may be formed, and upon the erect or slanting direction of the rock, or other retentive body in which the water is contained; where the rock has a slanting or horizontal inclination, the whole of the different springs or outlets, that show themselves on the surface, may originate from or be connected with the same collection or body of water, and may be all drained and dried up by cutting off, or letting out, the main body of water, by which they are supplied, at the inferior part of the reservoir, or that part where the water would of its own accord readily run off if it were not confined beneath an impervious covering of clay or some other material.

3942. But in cases where the rock lies in an erect or perpendicular form, and contains only partial collections of water, in some of the more open cracks or fissures of the stone, that discharge themselves at various openings, or outlets, that have not the least connection with each other, it would be an idle and fruitless endeavor to attempt the cutting of them off by means of one drain (fig. 490 a), or by boring into any one of them in particular, without cutting a drain into each (a, b, c). In this case it is more advisable to make the main drain wholly in the clay, with small cuts made up to each outlet, than along the place where the springs burst out; as in that line of direction it would be too greatly in



the rock, and consequently be extremely difficult to cut, on account of the nature and disposition of the stone: when the water passing out on the line of the springs can be found by the auger in the main drain, at the point where it joins it, it will, it is observed, be the more completely cut off; but where this is not practicable, the depth of the small cuts may reduce it to such a level as will prevent its flowing over and injuring the surface of the land below it.

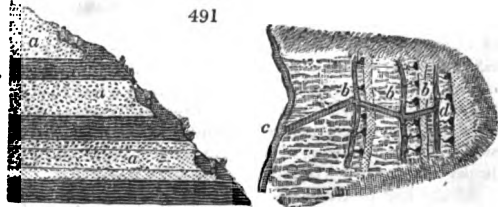


3943. In such hills as are constituted of alternate strata of rock, sand, and clay, the surface of the latter may frequently be wet and swamp, while that of the former is dry, and capable of producing good crops of grass; in all such cases, in order to drain the land completely, as many cuts will be necessary as there may happen divisions of wet and dry soil: the summit, or most elevated part of such hills, being mostly formed of loose porous materials, through which the rain and other water descends, till its passage becomes obstructed by some impervious bed or stratum, such as clay, when it is forced up to the surface, and runs or oozes over the obstructing stratum; and after having overflowed, the upper clay surface is immediately absorbed and taken up by the succeeding porous one, and, sinking into it in the same way as before, passes out again at the lower side of it, and renders the surface of the next clayey bed prejudicially wet as it had done in the first. In this way the same spring may affect all the other strata of the same kind of which the hill consists, from the highest part down the whole of the declivity, and produce in the basin, or hollow at the bottom, a lake or bog, should there not happen to be a passage or opening to take away the water. In order effectually to drain hills of this kind, it will be the most advisable to begin by forming a trench along the upper side of the uppermost rushy soil, by which means the highest spring may be cut off; but as the rain and other water that may come upon the next portion of porous soil may sink down through it to the lowest part, and produce another spring, a second cut must be made in that part to prevent the water from affecting the surface of the succeeding clayey bed. And similar cuts must be formed so far down the declivity as the same springs continue in the same way to injure the land, and in some cases a sufficiency of water may probably be obtained to irrigate the land below, or some other useful purpose.

SECT. III. Of the Methods of draining Mixed Soils.

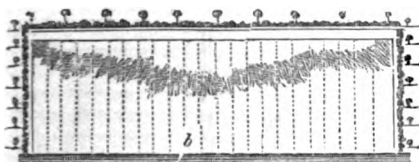
3944. Where the soil is of a mixed and varied nature, but the most prevailing parts of the clayey kind, the business of draining is considerably more tedious and difficult than where the superficial and internal parts have greater regularity. In such sorts of lands, as all the different collections of water are perfectly distinct from each other, by means of the beds of clay that separate them, each collection becomes so much increased, or accumulated, in the time of heavy rains, that they are filled quite to the level of the surface of the clay by which they are surrounded; when the water getting a free passage, as it would over the edges of a bowl or dish, overflows and saturates the surface of that bed of clay in such a manner, as to render it so perfectly wet and sour, that its produce becomes not only annually more and more scanty, but the soil itself more sterile and unproductive.

3945. From the sand-beds (fig. 491 a, a, a) in such cases having no communication with each other, it must evidently require as many drains (b, b, b) as there are beds of this kind, in order fully to draw off the water from each of them. A drain or trench is therefore recommended to be cut from the nearest and lowest part of the field intended to be drained (c), up to the highest and most distant sand-bank (d), in such a line of direction as, if possible, to pass through some of the intermediate sand-beds, and prevent the labor and expense of making longer cuts on the sides, which would otherwise be requisite.



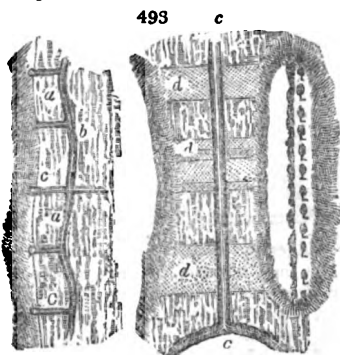
3946. Where the different beds of sand and clay are of less extent, and lie together with greater regularity, they can be drained in a more easy manner with less cutting, and of course at less expense. Below the layers or beds of sand and clay that lie, in this manner, alternately together, and nearly parallel to each other, is generally a body

of impervious clay, which keeps up the water that is contained in the sand, and which, being constantly full, renders the adjacent clay moist, and in wet seasons runs or trickles over it. As in these cases, the principal under-stratum of clay is rarely above four or five feet below the surface, a drain (fig. 492 *a*) is advised to be cut to that depth through the middle of the field, if it have a descent from both sides; but if it decline all to one



side, the drain must be made in that place (*b*), as the water will more readily discharge itself into it; and, unless the field be of great extent, and have more depressions or hollows in it than one, one drain may be quite sufficient for the purpose, as by crossing the different beds that retain the water, it must take it off from each of them.

3947. A principal difficulty in draining ground of this nature, and which renders it impracticable by one drain, is when the direction of the alternate layers, or beds of clay and sand, lie across the declivity of the land (fig. 493 *a*, *a*), so that one drain can be of no other service than that of conveying away the water after it has passed over the different strata, and would naturally stagnate in the lowest part of the field, if there was no other passage for it. Where the land lies in this way, which is frequently the case, it will therefore be necessary, besides the drain in the lowest part (*b*), to have others cut up from it in a slanting direction across the declivity (*c*, *c*), which, by crossing all the different veins, or narrow strata of sand (*d*, *d*, *d*), may be capable of drawing the water from each of them.



3948. In forming the drains in these cases, it is recommended that, after laying the bottom in the manner of a sough, or in the way of a triangle, it be filled some way up by small stones, tough sods being applied, the green side downwards upon them before the mould is filled in. But where stones cannot be readily procured, faggots may be employed in their place where they are plentiful: the under part of the drain being laid, or coupled with stones, so as to form a channel or passage for the conveyance of the water that may sink through the faggots, and for the purpose of rendering them more durable; as where the water cannot get freely off, which is generally the case where there is not an open passage made of some solid material, it must, by its stagnation, soon destroy the faggots, and choke up the drain.

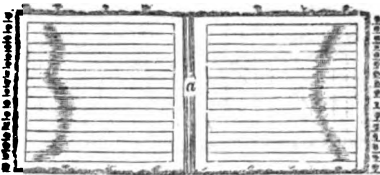
SECT. IV. Of the Methods of draining Retentive Soils.

3949. The practical mode of draining retentive soils, is materially different from that which has been described above. Many tracts of level land are injured by the stagnation of a superabundant quantity of water in the upper parts of the surface materials, which does not rise up into them from any reservoirs or springs below. The removal of the wetness in these cases may, for the most part, be effected without any very heavy expense. From the upper or surface soil in such cases, being constituted of a loose porous stratum of materials, to the depth of from two to four or five feet, which has a stiff retentive body of clay underneath it, any water that may come upon the surface from heavy rains, or other causes, readily filtrates and sinks down through it, until it reaches the obstructing body of clay which prevents it from proceeding; the consequence of which is, that the porous open soil above is so filled and saturated with water, as to be of little utility for the purpose of producing crops of either grain or grass. Land situated in this way, is frequently said by farmers to be wet-bottomed. In order to remove this kind of wetness, it seldom requires more than a few drains, made according to the situation and extent of the field, of such a depth as to pass a few inches into the clay, between which, and the under surface of the porous earth above, there will obviously be the greatest stagnation, and consequently, collection of water, especially where it does not become much visible on the surface. In these cases there is not any necessity for having recourse to the use of the boring instrument, as there is no water to be discharged from below.

3950. When the field to be drained has only a slight declination, or slope, from the sides towards the middle, one drain cut through the porous superficial materials into the clay

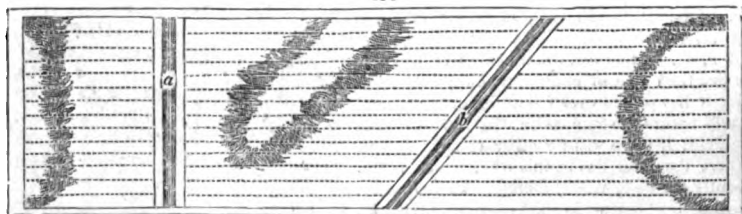
in the lowest part of the ground (*fig. 494 a*), may be sufficient to bring off the whole of the water detained in the porous soil. This effect may likewise be greatly promoted, by laying out and forming the ridges so as to accord with the direction of the land, and by the use of the plough or spade in removing obstructions, and deepening the furrows. In such situations, where the drain has been formed in this manner, the water will flow into it through the porous surface materials, as well as if a number of small trenches were cut from it to each side, as is the practice in Essex and some other parts of the country; but which is often an unnecessary labor and expense. The drain made in the hollow may frequently serve as a division of the field (*a*), in which case it may be open; but in other circumstances it may be more proper to have it covered.

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3951. Where a field of this description has more than one hollow in its surface (*fig. 495 a, b*), it will obviously be requisite to have more than one main drain; but when it is nearly level, or only inclines slightly to one side, a trench or drain along the lowest part, and

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the ridges and furrows formed accordingly, may be sufficient for effecting its drainage. There may, however, be cases, as where a field is large and very flat, in which some side-cuts from the principal drain may be necessary, which must be made a little into the clay, and as narrow as they can be wrought, and then filled up with stones or other suitable materials.

3952. What is called the *Essex method of draining* in ploughed springy lands, where the surface soil is tenacious, is described by Kent, and consists in substituting small under-drains (*fig. 496 a*) for open furrows; or in some cases having a small under-

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drain beneath (*b, b*) every other or every third furrow. These drains lead to side or fence ditches (*c*), where they discharge themselves.

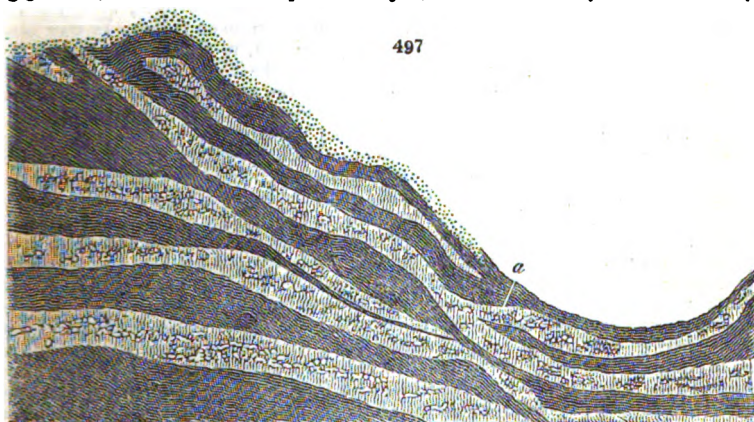
3953. Where the clay constitutes the surface, and the porous body is underneath, the injurious stagnant water cannot possibly get off, without the assistance of drains being formed for the purpose. Soils of this nature are drained with difficulty, and require a much greater number of trenches or cuts than those of any other kind, as they must be marked out and disposed in such a way as to collect and convey the water every where from the surface; as it can only force itself off into them from above, being prevented from sinking in through the clay, as in those soils of a contrary kind. Where there happens to be hollows or irregularities in the surface of the land, water may often be observed to continue standing in them, at the distance of but a few feet from the drain. In draining such lands, it will always be necessary, in the first place, to make a large or conducting drain at the lowest part, or the end of the field, for the purpose of receiving and conveying away the water collected by the less collateral cuts which it may be necessary to make on each side of it. Where it suits for the purpose of dividing the land, this principal drain may be better to remain open than be covered, as by that means the mouths or outlets of the different small drains that come into it may be conveniently examined, and cleared out when necessary.

3954. The construction of the ridges in such soils, so as they may accord with the declivity, is a matter that must be carefully kept in view. They should in all such cases have, also, that degree of elevation or roundness in the middle, that may be suffi-

cient to afford the water ready fall into the furrows, which should likewise have such a depth and fall as may take it quickly into the drains. The ridges, besides being well laid up, should have small open drains formed in a slanting direction across them, in such a manner as to form communications with one another, and with the furrows; by which means they are made to perform the office of drains, the water coming upon the ridges being thus readily conveyed into the furrows, where it proceeds till impeded in its course by the rising of the ground or other causes; it then passes through the open cross-drains into others where the descent is greater, and is ultimately conveyed off into the ditch, or other passage, at the bottom of the enclosure. The elevation of the ridges should probably too, be made greater for the winter than the summer crops, as there must be much more injurious moisture at the former than the latter season. This may be easily accomplished at the time of ploughing the land. Some useful observations on this description of drainage will be found in Marshal's work on *Landed Property*, and in Dr. Anderson's *Treatise on Draining*.

SECT. V. *Methods of draining Mines, Quarries, and Pits.*

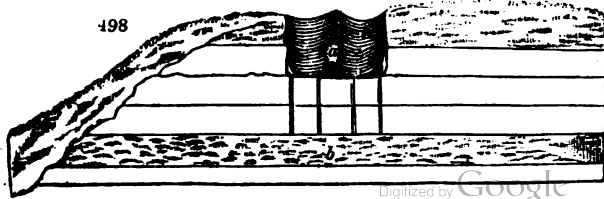
3955. *Where pits, mines, or quarries, happen to be formed at the bottom of declivities, and are inconvenienced or wholly obstructed, either in the digging or working, by the water contained in them, it may be possible, in many cases, to prevent its coming into such mines or pits, by cutting or boring into the lower parts of the porous strata (fig. 497 a).* In order to accomplish this object, it will be necessary to ascertain if any



porous stratum presents itself higher up the elevation than the place where the mine or pit is formed, that may conduct the water it possesses to the porous body that is below it; as, where such a stratum is discovered by cutting into it, much of the water may be drawn off and prevented from passing down. But notwithstanding the water from above may be cut off in this way, a quantity sufficient to inconvenience the working of the mine or pit may still filtrate from the sides of the porous bed, even though it may incline in the direction of the lower ground. When this is the case, it may, however, be readily taken away at some place in it. To accomplish this, and thereby obviate the effects of the water, the termination of the porous stratum (fig. 497 a) below the pit must be ascertained; and where there is any mark of a natural outlet at the place, a large drain should be formed, in order to admit the water to flow off with more expedition. Where, however, there is a thick bed of some impervious substance, such as clay, placed upon the termination of the porous material, the drain need only be cut a little way into that, as by boring through the rest a sufficient passage may be given to discharge the water. In this way, the draining of such grounds as lie above or near to mines or pits may be of great advantage.

3956. *Where a quarry or other pit to be dried (fig. 498 a) is situated above a porous*

stratum, whether of rock or gravel it may sometimes be drained by boring into the latter (b). In this way different chalk pits and lime quarries have been



drained in Kent and Hertfordshire. (*See the Reports of these Counties.*) In marl-pits also, which, from the nature of their situation, mostly require much cutting through some part of their sides, in order to remove the water that prevents their being wrought, the mode of letting the water down by means of pits dug through the upholding stratum below the bed of marl into the porous materials underneath, might be economically practised. In such cases, the number of the pits must be proportioned to the space occupied by the marl; and when they are required to be of such depths as to be liable to give way, they should be built up, or nearly filled with loose stones, so as to admit the water to pass off; such lateral drains as are necessary communicating with them. In some situations of the pits, as where the bank slopes lower on the contrary side than the level of the water, an easier mode may be practised; such as by forming a drain in it, and then perforating with a horizontal boring instrument into the terminating part of the stratum that holds the water; thereby removing and keeping it below the level of the marl. And in addition to these, in some cases, as where the water of such pits proceeds from springs in the high grounds above them, it may be useful to intercept and convey it away before it reaches the marl-pits.

SECT. VI. *Of the Formation of Drains, and the Materials used in filling them.*

3957. *Drains should be formed with as much truth and exactness as possible; such laborers as are not dexterous in using their tools seldom make them well.* The most general method of performing this sort of work is by admeasurement, at so much a rod, or a score rods, which necessarily induces the workmen to do as much as they possibly can; they should, therefore, be frequently inspected, to see that they keep to the proper and required depth, and that the earth taken out be laid in such a manner as not to fall down again into the drains in time of filling them, and that the surface-mould be kept on one side free from the clayey or other material of the inferior stratum.

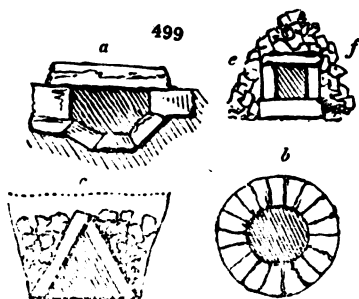
3958. *When there is any declivity in the ground, drains should be made in a slanting direction across it, instead of the old method of conducting them according to the nature or inclination of the slope.* By attending to the former mode of cutting the drains, the wetness is not only more effectually removed, but, by allowing the water to pass away in an easy current, they are rendered less liable to be choked, or, as it is frequently termed, blown up, by which artificial oozings of water are sometimes formed in such places. But where grounds are either quite or nearly level, it has long been a general practice to cut the drains at the different distances of about sixteen, twenty-four, and thirty-two feet from each other, across the fields from the different ditches, according to the circumstances of the lands; or, indeed, where the drains, either from some slight unevenness of the surface, or other causes, can only be made to flow at one end, to avoid cutting them further on one side than where the ditch is capable of taking away the wetness. In cases where the declivities of a piece of ground are various, and have different inclinations, the drainer should constantly attend to them, and direct the lines of his drains in such a manner as that they may cross the higher sides of the different declivities in a slanting direction.

3959. *The depth of drains must depend upon the nature of the soils, the positions of the land, and a great variety of other more trifling circumstances.* It was formerly the custom to make them three or four feet in depth, but by modern drainers they are rarely made to exceed thirty inches, or a few inches more, the most general depth being from twenty-four to twenty-six inches. As the main drains have more water to convey away, and are generally of greater length than the lateral ones, they should always be cut somewhat deeper; and where the materials of the soils are porous, the greater depth they are cut, the more extensively they act in lowering the wetness of the land to such a degree as that it can be little injurious to the crops that may be produced upon it: when, however, the operator reaches any impervious material in the soil, through which the moisture cannot pass, it will be quite useless to dig the trench to a greater depth. If it be clay, by going a few inches into it, a more safe passage for the moisture may however be secured. It must notwithstanding be invariably attended to, that the depth of the drains be such as that the treading of heavy cattle may not displace, or in any way injure, the materials employed in constructing or filling them. It may be noticed too, where the horses in ploughing tread in the bottom of the furrow, at the depth of four or more inches below the surface, that, if eight or ten more be allowed for the materials with which the drains are filled, when the depth of the trenches are not more than twenty-four inches, there will only be nine or ten inches of earth for the support of the horses when ploughing. Where the earth has been stirred, such a depth must undoubtedly be too little, and in some measure proves that drains of such a depth are not sufficient. By cutting them down to the depth of two feet and a half in the stiffer soils, they will seldom be penetrated to, or have too great a depth; and in the pervious ones a still greater depth is highly useful, and constantly to be practised.

3960. *The practice of cutting the drains as narrow as possible, which has lately been much attended to, is of importance, as it causes a considerable saving of the*

matters employed in filling them up, whether they be wood or straw; but in cases where bricks or stones are employed, this cannot be so much attended to; however, there is seldom a necessity for a greater width than about a foot, provided the stones be coupled at the bottom, or thrown in a mixed way; nor more than sixteen inches where laid in the manner of a sough or channel. But of whatever depth the materials may be, the earth or mould by which they are covered up should not be less in depth than a foot; in arable lands it should be more.

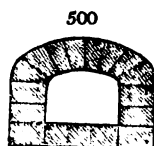
3961. *The different sorts of drains in use may be classed in two divisions; drains of conveyance (fig. 499 a, b.) alone, and drains of conveyance and collection jointly (fig. 499 c, d).* In the former, all that is necessary is a channel or passage for the water of sufficient dimensions, which may be formed by pipes of different kinds, arched or barrel drains (b), and box or walled drains (a). The construction of the latter requires not only an opening for conveying the water, but a supercumbent or surrounding stratum (e, f) of sufficient porosity to admit and induce all latent water to find its way to the channel of conveyance. The most complete drain of conveyance is a large pipe of metal, masonry, or brick-work; and the most complete collecting drain, one formed with a channel built on the sides, and covered with flat-stones, with a superstratum of round stones or splinters, diminishing to the size of gravel as they rise to the surface, and there covered with the common soil. As the best constructions, however, are not always practicable, the following are a few of the leading sorts adapted for different situations.



3962. *For drains of conveyance, there are the walled or box drain (fig. 499 a), the barrel drain (b), the walled or the triangular drain (c), and arched drain (fig. 500).*

3963. *Drains of collection are formed of stone, brick, gravel, cinders, wood, spray, straw, turf, and earth alone.*

3964. *The boxed and rubble drain (fig. 501.), has been already described as a drain of conveyance and collection. The common rubble*

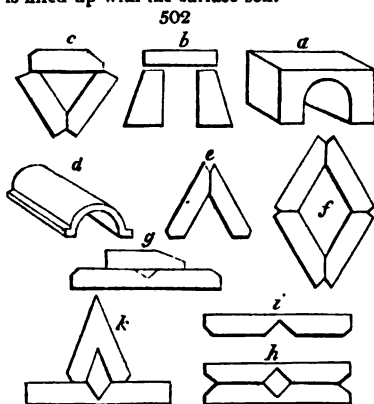


drain; or by the use of bricks made on purpose, of which there are great variety (fig. 502. a to k.) Draining tiles to be used with effect as collecting drains, should always be covered a foot in depth or more with stones or gravel.

3966. *On the Marquess of Stafford's estate, "an allowance of draining tiles is made, wherever the exertions of the tenants seem to merit such a reward. In order to secure the drains being properly filled up with stones above the tiles, the tenant is obliged to drive a sufficient quantity of stones or cinders from the furnace, and lay them on the ground, previous to an order being made for the delivery of the tiles. Without attending to this important circumstance, much draining would be thrown away. The park at Trentham is a complete illustration of this remark. The draining of this spot was conducted under the direction of Elkington. The wetness with which these lands are affected, does not arise from any line of springs bursting out from the upper grounds, to which that gentleman's system of deep drains could be applied; but is occasioned almost entirely by the retentive nature of the subsoil, and for its being intermixed with small basins of sand, which lie detached and unconnected with each other, in the bed of clay. To cure this species of wetness, a number of small drains, well filled up, with one cut into each of these beds of sand is necessary, in order effectually to cure the evil. In pursuance of this plan, a great part of the park at Trentham has been lately drained over again, by making a number of small shallow drains, about fifteen feet asunder, in some instances above the old ones, taking particular*

drain is formed of rough land-stones of any sort not exceeding six or seven inches in diameter, thrown in the bottom, with smaller ones over, and if to be had, gravel or ashes at top. On this is laid a thin layer of straw or haulm of any kind, and the remainder is filled up with the surface soil.

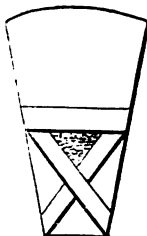
3965. *The brick drain is formed in a great variety of ways, either from common bricks and bats in imitation*



care to fill them up as well as possible, and not to permit any clay to be laid over the stones. This has proved effectual." (Lock.)

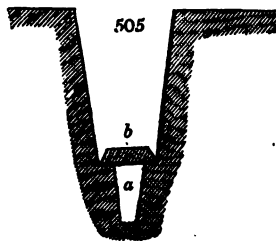
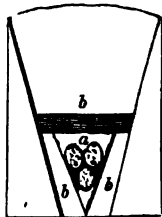
3967. *The gravel or cinder drain* is seldom made deep, though, if the materials be large, they may be made of any size. In general they are used in grass lands; the section of the drain being an acute angled triangle, and the materials being filled in, the smallest uppermost, nearly to the ground's surface.

3968. *The wood drain* is of various kinds. A very sufficient and durable construction consists of poles or young fir-trees stripped of their branches and laid in the bottom of the drain lengthways. They are then covered with the branches and spray. Another form is that of filling the drain with faggot-wood with some straw over. A variety of this mode (fig. 503.), is formed by first setting in cross stakes to prevent the faggots from sinking; but they are of no great use, and often occasion such drains to fail sooner than common faggot drains, by the greater vacuity they leave after the wood is rotten. In some varieties of this drain the brush-wood is first laid down alongside the drain and formed by willow or other ties into an endless cable of ten or twelve inches in diameter and then rolled in, which is said to form an excellent drain with the least quantity of materials, and to last a longer time than any of the modes above mentioned. Some cut the brush-wood into lengths of three or four feet, and place them in a sloping direction with the root end of the branch in the bottom of the drain; others throw in the branches at random with little preparation and cover them with spray, straw, or rushes, and finally the surface soil.



3969. *The spray drain* is generally like the gravel drain, of small size, and formed like it, with an acute angled bottom. In general, the spray is trod firmly in; though in some cases it is previously formed into a cable, as in the brush-wood drain. Drains of this sort are much in use in grass lands, and when the spray of larch wood, heath, or ling can be got, they are of great durability.

3970. *The straw drain*, when reeds, rushes, and bean straw is used, is sometimes made like the spray drain, by pressing the loose material down, or forming a cable; but in general the straw is twisted into ropes as big as a man's leg, by the aid of a machine (2457.), and three or more of these (fig. 504 a) laid in the bottom of a triangular drain, with or without the protection of three turves (b). Where some sorts of moss, as sphagnum or lycopodium can be got, these drains are of unknown durability. Drains formed in this manner, through tough and retentive clays, will be found in a short time after the work is finished, to have formed over the straw with which the drain was filled, an arch of sufficient strength to support the incumbent weight of the soil, and the casual traffick of the field. In twelve or eighteen months it may be observed, that the straw, being of one uniform substance, is all rotted and carried away, leaving a clear pipe through the land in every drain. The passage of the water into these drains may be much facilitated, by a due attention to filling them with the most friable and porous parts of the surface the field may afford.



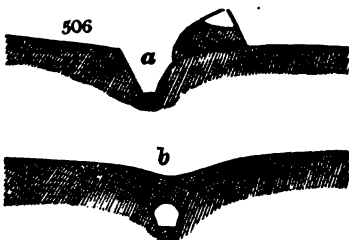
3971. *The turf drain* (fig. 505.), may be made of any convenient depth, but it must be at least the breadth of a turf at bottom. The drain being dug out as if it were to be filled with stones or any ordinary material, the operator next, with a spade three inches wide, digs a narrow channel along its centre (a), clearing it out with the draining scoop; and over this the turves (b) are laid without any other preparation, or any thing put over them but the earth that was excavated. This is found to be a very cheap, and, considering the materials, a surprisingly durable method of draining; answering, in pasture-fields especially, all the purposes that the farmer

can expect to derive from drains constructed with more labor, and at a much greater expense. They are said to last frequently twenty years and upwards: but the period be supposed they will continue to prove effectual, must depend on the nature of the current of water.

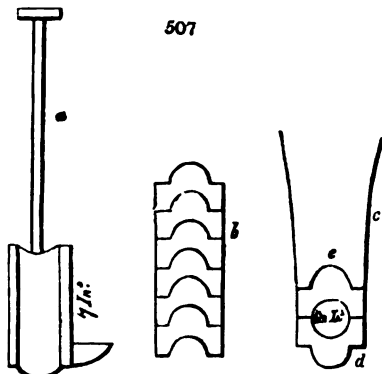
triangular sod drain is thus made: when the line of drain is marked out, the form of a wedge, the grass side being the narrowest, and the sods twelve to eighteen inches in length. The drain is then cut to the depth retracted to a very narrow bottom. The sods are then set in with the narrow end towards, and pressed as far as they will go. As the figure of the drain

does not suffer them to go to the bottom, a cavity is left which serves as a watercourse ; and the space above is filled with the earth thrown out.

3973. *The hollow furrow drain* is only used in sheep-pastures. Wherever the water is apt to stagnate, a deep furrow is turned up with a stout plough (fig. 506 a). After this, a man with a spade pares off the loose soil from the inverted sod, and scatters it over the field, or casts it into hollow places. The sod thus pared, and brought to the thickness of about three inches, is restored to its original situation, with the grassy side uppermost, as if no furrow had been made (b). A pipe or opening is thus formed beneath it, two or three inches deep in the bottom of the furrow, which is sufficient to discharge a considerable quantity of surface water, which readily sinks into it. These furrows, indeed, are easily choked up by any pressure, or by the growth of the roots of the grass ; but they are also easily restored, and no surface is lost by means of them.



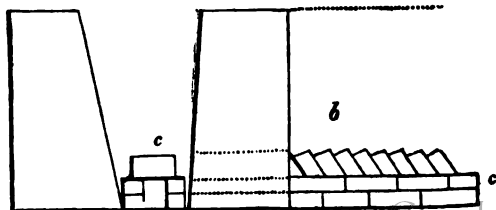
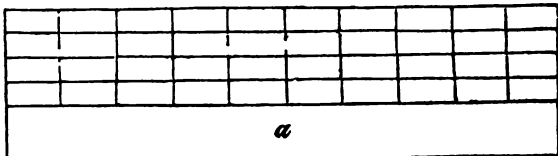
3974. *The earth drain*, called also *the clay pipe drain*, is better calculated for the purpose of an aqueduct, or conveyance of water, than for drying the soil. A drain is dug to the necessary depth, narrow at bottom, in which is laid a smooth tree or cylindrical piece of wood, ten or twelve feet long, six inches in diameter at the one end, and five at the other, having a ring fastened in the thickest end. After strewing a little sand upon the upper side of the tree, the clay or toughest part of the contents of the trench is first thrown in upon it, and then the remainder, which is trod firmly down. By means of the ring and a rope through it, the tree is drawn out to within a foot or two of the small or hinder end, and the same operation repeated. A gentleman who has tried this experiment says, this clay pipe has conducted a small rill of water a considerable way under ground for more than twenty years, without any sign of failing.



3975. *Pipe drains of turf* are sometimes formed where the surface soil is a strong clay, as it is only turves from such a surface that are sufficiently durable. A semicylindrical spade (fig. 507 a), is used to dig the turves, the ground-plan of which (b) presents a series of semicircles or half pipes. The drain (c), being dug out to the proper depth, one turf is laid in the bottom (d), and another being placed over it (e), completes the pipe. The same sort of pipe drain has been formed out of solid beds of clay, and has served for a time to convey water. As collecting drains, of course, they can be of little or no use. This mode of draining appears to have been first practised by Hannah, an ingenious farmer in Wigtonshire. He adopted it for the purpose of

conveying water through running sand, in which only a pipe drain will last for a moderate time. After a number of years the clay turves were found effective in conveying away the water, and preventing the running away of the sandy sides of the drain.

3976. *A mode of turf draining in use in Cheshire*, is done in the following manner: The surface of the ground where the drain is intended to be cut, is marked out in parallelograms about the size of bricks on one side (fig. 508 a



and the opposite is left of the width of a common sod; i. e. nine inches wide. These sods are taken out at a spade's depth, and laid carefully by the side of the drain for covers. The sods (a), resembling bricks in their size and shape, are then dug, and laid carefully on the same side as the sods intended for covers. The drain is then sunk to its proper depth, and the stuff taken out is thrown to the other side. The bottom is levelled with proper draught for the water, and set with the sods like bricks (a), two in height on each side (c); these are covered with the larger sods set obliquely (b); the grass side of each sod being turned downwards. (*Ag. Rep. of Cheshire, 214.*)



3977. *The mole drain* (fig. 509.) is formed by the draining-plough of that name, already described (2522.), with the manner of using it. It is chiefly useful in pasture-lands, and especially in such as have some declivity, or are formed into ridges.

3978. *The wheel drain* is a very ingenious invention, described in *The Agricultural Report of the County of Essex*. It consists of a draining-wheel of cast-iron, that weighs about 4 cwt. It is four feet in diameter; the cutting-edge or extremity of the circumference of the wheel is half an inch thick, and increases in thickness towards the centre. At fifteen inches deep it will cut a drain half an inch wide at the bottom, and four inches wide at the top. The wheel is so placed in a frame, that it may be loaded at pleasure, and made to operate to a greater or less depth, according to the resistance made by the ground. It is used in winter when the soil is soft; and the wheel tracks are either immediately filled with straw ropes, and lightly covered over with earth, or they are left to crack wider and deeper till the ensuing summer; after which the fissures are filled with ropes of straw or of twisted twigs, and lightly covered with the most porous earth that is at hand. Thus, upon grass or ley lands, hollow drains, which answer extremely well, are formed at a trifling expense. It is said, that twelve acres may be fully gone over with this draining-wheel in one day, so as to make cuts at all necessary distances.

3979. *Surface-gutters made by cart-wheels* have been used by Middleton, on meadows in Surrey. To the felly of a common cart-wheel (fig. 510 a), is added a piece of wood, the section of which is a truncated triangle (b), and on this is fixed a piece of 510 iron completing the triangle (c). The cart is loaded and driven so as the prepared wheel may run in the furrow; or, if there are no furrows, both wheels may be prepared, and the loaded cart drawn by two horses, may be led over the whole field, forming parallel gutters, at four or five feet distance. The advantage of this mode of surface draining is, that the herbage is only pressed down, not destroyed, and rises up again in spring. The operation, for that reason, requires to be renewed every winter.



3980. *The best season for marking out and forming drains*, is the spring or beginning of summer; because then, the land springs being still in vigor, are more easily discovered and traced than at a later period. When the ground is more on the surface, it is a useful precaution, after the line of drain is indicated, to cart on the materials for filling before digging the drain, as the weight of the carriages and horses are apt to press in the sides of the drain. In the case of straw, turf, or earth drains, where the ground is of a firm texture, this precaution does not apply. In filling drains, the earth should always be raised somewhat above the general surface, to make allowance for sinking.

3981. *In forming small drains, chiefly for retentive soils*, the common plough has been used in many places, and with some advantage. The method practised by Young, of Clare, and which he has himself described in *The Annals of Agriculture*, from very ample practice, is this: he says, when he has marked the drains in a field usually a rod asunder, he draws two furrows with a common plough, leaving a baulk betwixt them about fifteen inches wide; then with a strong double-breasted plough, made on purpose, he splits that baulk, and leaves a clean furrow fourteen or fifteen inches below the surface; but where the depth of soil requires it, by a second ploughing he sinks it to eighteen or twenty inches: it is then ready for the land-ditching-spade, with which he digs, fifteen inches deep, a drain as narrow as possible. But the method followed by some farmers, who do not possess ploughs made on purpose for the work, is this: With their common plough, drawn by four or five horses, and usually stirring about four or five inches deep, they turn a double furrow, throwing the earth on each side, and leaving a baulk in the middle. This baulk they raise by a second bout, in the same manner: then they go in the open furrow twice, with their common double-breast plough, getting what depth they can. After this they shovel out all the loose mould and inequalities to the breadth of about a foot; and thus having gained a clear open furrow, the depth varying according to the soil and ploughs, but usually about eight or nine inches, they dig one spit with a draining spade sixteen inches deep, thus gaining in the whole twenty-four or twenty-six inches. But as this depth is seldom sufficient, when necessary they throw

out another, or even two other spits, which makes the whole depth from thirty to forty inches.

3982. *The duration of drains* must necessarily depend on the nature of the materials with which they are filled, and in some measure on the quality of the soil, as certain species of land have the power of preserving wood or other perishable materials much longer than others. Stones last till accidental causes impede the flowing of the water, and may last for ever. Wood perishes in certain periods, but it does not follow that the drains should stop; if the earth arches, the water will necessarily continue to flow, which is found to be the case when wood, straw, and stubble, are rotten and gone. Drains that have been filled with bushes and straw, both which were rotten, have been observed to run well forty years after making.

3983. *The expense of drains* will of course vary with the soil, depth, price of labor, &c., and these circumstances are so different in different districts, and even in different parishes, that it accounts for the various reports of writers on the subject. Those farmers who are most solicitous to have the work well performed, contract with men only for digging and leaving clean, in order that the filling may be done by men paid by the day, as a greater security that it should be executed with all possible care; whatever may be the expense and trouble incurred in draining, it may be safely asserted, that if the work is judiciously contrived, and properly executed, no kind of outlay will prove so beneficial to the cultivator.

3984. *The enemies of drains*, according to Marshal, are moles, field mice, and the roots of trees; the two first may be kept under by traps or other devices; but the last enemy is not easily guarded against but in the laying out of the drain, which should always if possible be kept distant from trees or woody plants of any description.

SECT. VII. *Of the Implements peculiar to Draining.*

3985. *The tools peculiar to draining* are chiefly of the spade kind; there are also boring instruments of different kinds.

3986. *The draining-scoop* (fig. 511 a, b, c), is a crooked kind of tool made use of in some cases for clearing out the loose materials from the bottoms of drains. It is formed of different sizes and breadths, according to the drains, and in working is drawn or pushed along the bottom.

3987. *The draining shovel* (d), is another sort of implement employed for the same purpose as the above. It is made with a crooked handle, and the edge of the shovel part is turned up, in order to prevent the materials from falling off.

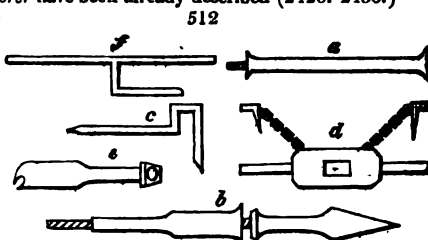
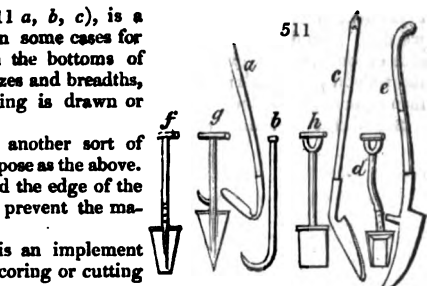
3988. *The draining sod knife* (e), is an implement made use of with great benefit in scoring or cutting out the sward in forming drains.

3989. *Draining spades* (f, g, h), are made of different breadths, so as to follow each other, and cut the drains narrow at the bottoms. An upper and pointed draining-spade, (g) is in general use, and a wooden one (h) is employed in peat soils.

3990. *The draining straw-twisting engine*, is a machine of very simple construction, already described (2457.), and capable of being readily removed, contrived for the purpose of twisting straw into ropes, in order to the filling of drains with it.

3991. *The common borer and peat borer* have been already described (2428. 2430.)

3992. *The common draining auger* (fig. 512.) consists of four parts, the shell or wimble, the chisel, the rod, and the handle. The auger shell or wimble (e), as it is variously called, for excavating the earth or strata through which it passes, is generally from two and a half to three and a half inches in diameter; the hollow part of it one foot four inches in length, and constructed nearly in the shape of the wimble



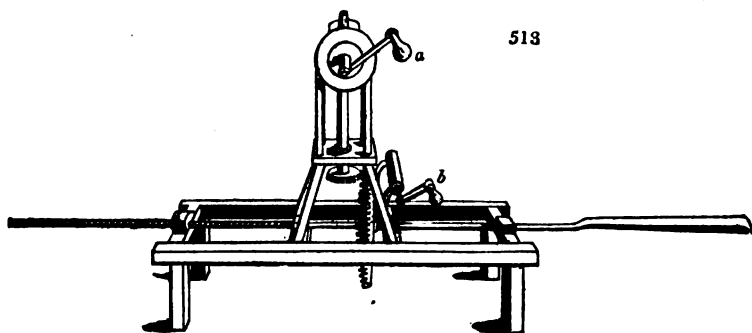
used by carpenters, only the sides of the shell come closer to one another. The rods (a), are made in separate pieces of four feet long each, that screw into one another to any assignable length, one after another, as the depth of the hole requires. The size above the auger is about an inch square, unless at the joints, where, for the sake of strength, they are a quarter of an inch more. There is also a chisel and punch (b), adapted for screwing on in going through hard gravel, or other metallic substances, to accelerate the passage of the auger, which could not otherwise perforate such hard bodies. The punch

is often used, when the auger is not applied, to prick or open the sand or gravel, and give a more easy issue to the water. The chisel is an inch and a half or two inches broad at the point, and made very sharp for cutting stone; and the punch an inch square, like the other part of the rods, with the point sharpened also. There is a shifting handle of wood (*d*), that is fastened with two iron wedges affixed to it, for the purpose of turning round the rods in boring; and also two iron keys (*f*, *c*), for screwing and unscrewing the rods, and for assisting the handle when the soil is very stiff, and more than two men required to turn it.

3993. *To judge when to make use of the borer* is a difficult part of the business of draining. Some have been led into a mistaken notion, both as to the manner of using it, and purpose for which it is applied. They think, that if by boring indiscriminately through the ground to be drained, water is found near enough the surface to be reached by the depth of the drain, the proper direction for it is along these holes where water has been found, and thus make it the first implement that is used. The contrary is the case, and the auger is never used till after the drain is cut; and then for the purpose of perforating any retentive or impervious stratum, lying between the bottom of the drain and the reservoir or strata containing the spring. Thus does it greatly lessen the trouble and expense that would otherwise be requisite in cutting the trench to that depth to which, in many instances, the level of the outlet will not admit.

3994. *The manner of using it* is simply thus: in working it, two, or rather three men are necessary. Two stand above, one on each side of the drain, who turn it round by means of the wooden handles, and when the auger is full they draw it out; and the man in the bottom of the trench clears out the earth, assists in pulling it out, and directing it into the hole, and he can also assist in turning with the iron handle or key, when the depth and length of rods require additional force to perform the operation. The workmen should be cautious in boring, not to go deeper at a time without drawing, than the exact length of the shell, otherwise the earth, clay, or sand, through which it is boring, after the shell is full, makes it very difficult to pull out. For this purpose the exact length of the shell should be regularly marked on the rods, from the bottom upwards. Two flat boards, with a hole cut into the side of one of them, and laid alongside of one another over the drain in the time of boring, are very useful for directing the rods in going down perpendicularly for keeping them steady in boring, and for the men standing on when performing the operation.

3995. *The horizontal auger* (fig. 513.), is another boring instrument employed in



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particular cases. It was invented by Halford, of Hathern, in Leicestershire, but is little used. The advantages of it are, in some cases, considerable, by lessening the expense of cutting, and performing the work in a much shorter time. Where a drain or water-course has to pass under a bank, road, hedge, wall, rivulet of water, or for drying marl-pits, &c. it may be used to advantage in excavating a sufficient passage for the water, without opening a trench. In laying leaden pipes for the conveyance of water, it is also useful in making a hole in which the pipe may be laid without opening a cut on purpose. For tapping springs, or finding water at the bottom of a hill, either for the supply of a house, or for draining the ground, it may likewise be used with success; as the water of the spring when hit on, will flow more easily, and in greater abundance through a horizontal or level, than through a perpendicular outlet.

3996. *The manner of using it* is this: suppose a lake or pond of water, surrounded with high banks, to be emptied, if the ground declines lower on the opposite side, find the level of the bank where the perforation is to be made. There smooth the surface of the ground so as to place the frame nearly level with the auger, pointing a little upwards. It requires two men to turn the handles at top (*a*), in order to work it; and when the auger or shell is full, the rods are drawn back by reversing the lower handle (*b*); and

other rods added at the joint when the distance requires them. In boring through a bank of the hardest clay, two men will work through from thirty to forty feet in a day, provided there is no interruption from hard stones, which will require the chisel to be fixed on in place of the shell, and longer time to work through. If the length to be bored through is considerable, or longer than the whole length of the rods, a pit must be sunk upon the line, down to the hole, for placing the frame when removed, and the operation carried on as before.

CHAP. II.

Of Embanking and otherwise protecting Lands from the Overflowing or Encroachment of Rivers or the Sea.

3997. *Lands adjoining rivers or the sea*, are frequently subject to be overflowed, or washed away, or to be injured by the course of rivers being changed during great floods. The subject of this chapter therefore embraces that of embanking and guarding the banks of rivers.

SECT. I. *Of Embanking Lands from Rivers or the Sea.*

3998. *The great value of alluvial soil* to the agriculturist, no doubt, gave rise to the invention of banks, or other barriers, to protect soils from the overflowing of their accompanying rivers. The civilized nations of the highest antiquity were chiefly inhabitants of valleys and alluvial plains; the soil, moisture, and warmth of which, by enlarging the parts, and ameliorating the fruits of the vegetable kingdom, afforded to man better nourishment at less labor than could be obtained in hilly districts. The country of Paradise, and around Babylon, was flat, and the soil saponaceous clay, occasionally overflowed by the Euphrates. The inhabited part of Egypt was also entirely of this description. Historians inform us, that embankments were first used by the Babylonians and Egyptians, very little by the Greeks, and a good deal by the Romans, who embanked the Tiber near Rome, and the Po for many stadia from its embouchure. The latter is perhaps one of the most singular cases of embankment in the world.

3999. *The oldest embankment in England* is that of Romney Marsh, as to the origin of which, Dugdale remarks, "there is no testimony left to us from any record or historian." (*History of Embanking and Draining.*) It is conjectured to have been the work of the Romans, as well as the banks on each side of the Thames, for several miles above London, which protect from floods and spring tides, several thousand acres of the richest garden ground in the neighborhood of the metropolis. The commencement of modern embankments in England took place about the middle of the seventeenth century, under Cromwell. In the space of a few years previously to 1651, 425,000 acres of fens, morasses, or overflowed muddy lands, were recovered in Lincolnshire, Cambridgeshire, Hampshire, and Kent; and let at from 2s. 6d. to 30s. an acre. (*Hartie's Essays*, p. 54., 2d edit.) Vermuyden, a Fleming by birth, and a colonel of horse under Cromwell, who had served in Germany during the thirty years' war, was the principal undertaker of these works.

4000. *Very little has been written on the subject of embankments*, as a separate branch of art, by British authors. Dugdale's work is entirely historical and topographical. But the writings of Smeaton, Young, Gregory, &c., contain the general principles on which is founded the art of embanking, and every other operation connected with water, and Beatson, in *Communication to Board of Agriculture*. Dr. Anderson, Marshal, and some others, have written on the practice of the art. The works of this sort constructed in our own times will be found described in *The Agricultural Reports* of the maritime counties, especially of Lincolnshire, by Arthur Young. We shall first submit some general remarks on the principles of designing embankments, and next describe the principal kinds of banks with their application.

SUBSECT. 1. *General Principles of designing Embankments.*

4001. *The theory of embanking*, Marshal observes, is beautifully simple. The outward waters having been resisted by a line of embankment, and having receded, those that have collected internally are enabled, by their own weight, to open a valve, which is placed in the foot of the bank, and effect their escape: thus securing the embanked lands from inundation, though beset on every side with water.

4002. *The pressure of still water* against the sides of the vessel containing it, being as its depth, it follows, that a bank of any material whatever, impervious to water, whose section is a right angled triangle, and the height of whose perpendicular side is equal to that of the water it is to dam in, will balance or resist this water, whatever may be the

breadth of the surface of the latter; and, therefore, that as far as width or extent is concerned, it is just as easy to exclude the Atlantic ocean as a pond or a river of a few yards in width.

4003. *Embankments* may be considered in regard to their situation, direction, construction, and materials.

4004. *The situation of the bank* should be such that its base may not be exposed unnecessarily, to the immediate action of the waves, or the current. And, where the quantity of water is limited, as that of land floods in a particular river may be said to be, the more room it has left to spread in, the less height and strength the bank will require; and the power of the current will be proportionably lessened. It is to be recollected, however, in all cases where the channel of the water is liable to be warped or filled up, by sullage, that the narrower the space is, in which the water is confined, the stronger will be its current, and the less silt will, in ordinary cases, be deposited.

4005. *The direction of embankment* should be free from sharp angles, so as to occasion the least possible resistance to the current, whether of a land-flood, or the tide.

4006. *In the construction or form of the bank* there are certain principles to be observed. Its height and strength ought ever to be proportioned to the depth and weight of water which it will have to sustain: and, to increase its firmness, the inner face should lean towards it, as a buttress. But it is on the construction of the outer face, its strength, firmness, and durability principally depend. This ought to be made sloping, to a degree of flatness; for the twofold purpose of preventing resistance, and taking off the weight of water. In difficult cases, the outer surface may form an angle with a perpendicular line of 45 to 60 degrees, according to the force to be guarded against, and the materials to be employed.

4007. *The materials of the body of the bank* (as well as of the inner face), where the foundation is sound and firm, and the bank can be carried up, at a proper season, without great molestation from the water, may generally be the natural soil of the lands to be embanked. And, where merely the weight of stagnant or slowly moving water is to be guarded against, the outer slope may be of the same material. But where force, whether of waves or a strong current, will act immediately upon the bank, its outer face ought to be made proof against it; and its base to be particularly guarded, to prevent its being undermined; the most mischievous and irreparable disaster of embankments. Hence, when the foundation is not sufficiently firm, piles, timber, and masonry may be required, to insure success. And no man ought to begin a work of this nature, without attentively guarding it against every probability of miscarriage.

4008. *A system of drains and floodgates* is requisite for the purpose of freeing the embanked lands from internal waters.

4009. *In designing and setting out the main drain, or discharging channel, on the outside of the embankment*, there are points which require particular attention. The situation of the outfall, or mouth, with respect to the current of the water into which it opens, is of considerable importance. It ought to be such, that the current of the receiving water will not warp up the channel of the drain; but such, on the contrary, as will tend to clear the mouth and keep the channel free. If it were not to preserve the requisite character of an elementary work, it might be deemed unnecessary to add, that the mouth of the discharging drain should be situated as low as given circumstances and a prudent expenditure will allow, beneath the floodgate of the embankment; in order that, by inducing a sufficient current, the floodgate, as well as the mouth of the channel, may become free from obstructions. Against the open sea, or a wide estuary, where there is no disgorging channel, but where the waves reach the foot of the embankment, two floodgates may be required; one on the outer side to sustain the force of the waves, and prevent their blowing up the inner works; the other within to secure the passage the more effectually. The outer gate in this case is liable to be lifted with the agitation of the waves, and thereby to admit much water; but the inner valve being in a still undisturbed situation effectually stops its progress.

4010. *Where the discharge is made immediately behind a shifting beach*, and especially where the floodgate is necessarily placed level with or beneath the general surface of the gravel bank, through which the waters have been wont to force a channel, the valve is liable to be buried, and the channel to be closed up by every spring tide, and by every gale of wind which sets in upon it; and cannot be kept free but by unceasing labor and expense. In an obstinate case of this kind on Lord Cawdor's estate, in Pembrokeshire, the discharging floodgate is defended by a covered channel, carried out through the line or ridge of beach into the sea; being made strong enough to sustain the weight of the heaviest breakers. This, it is true, has been effected at a great expense, but nevertheless the improvement being of considerable magnitude, with great profit: and in every case, where an external valve is required, and where it is liable to be silted up, or loaded with sand or gravel, great attention to the outward channel, or some defence is necessary. For the floodgate, when loaded, cuts off all communication between the pent up waters and the

materials that impound them. They cannot, by loosening the obstructing matter, as nature would otherwise direct them, force their way through it; nor by surmounting it, can they wear down a channel, and thus set themselves at liberty.

4011. *In ordinary cases*, the outer floodgate may be guarded by a pile fence or jetty, run out from the foot of the embankment, across the known drift of the beach; and in such a manner as not to interrupt the outfall channel of the water; the gravel, &c. which such a safeguard may accumulate, being removed from time to time as occasion may require.

4012. *The best construction of the floodgate for the uses now under consideration is the common valve, hinging at the top, swinging outward and falling into a rabbeted frame.* In forming and hanging a floodgate of this construction, there are a few particulars worthy of attention. It should be made of seasoned wood, and ought to be double; the boards or planks of which it is formed being made to cross each other, to prevent its casting. It should fall truly, and fit neatly within a surrounding rabbet (to lessen the power of the waves to lift it); but not so closely or tight as to stick when swelled by moisture. To prevent this, as well as to give it additional tightness, its edges should not be square, but should bevel somewhat inward in the manner of a bung; the rabbet in the frame being made to answer it. In fixing the frame, it ought to be suffered to lean or batter inward; in which position the door will shut closer, and be less liable to the action of the waves in an exposed situation than it would if it were hung perpendicularly. It ought not, however, to lie so flat or heavy as to prevent the free escape of the internal waters.

4013. *The internal waters which rise within or fall upon the area of the embanked lands, are to be collected by a main drain, continued upward from the floodgate; and furnished with branches to spread over every part of the field of improvement, so as to draw the water as it collects, from every dip and hollow place, and thus free the surface effectually from stagnant water; saving such only as may be wanted for the use of pasturing stock.*

4014. *If alien waters have a natural and accustomed channel through the embanked area, it may be found necessary to raise a suitable bank at a proper distance on each side of the stream; in order to prevent its overflowing the area in times of floods.* Where it is found that an outlet cannot be had low enough to free the area entirely from surface water, it is requisite (though no alien waters intrude) to form an embanked channel or reservoir; to gain the required outfall, and to throw the waters which lodge on the lower grounds into this receptacle; by a draining mill, of which there are a great variety of constructions.

4015. *An embanked channel, if the banks are raised high enough, or are placed wide enough asunder, so as to contain a sufficient body of water, may have a further use; which, in some cases, may be of the highest importance to an improvement of this nature.* For, by the help of folding floodgates, such as are commonly seen in use for the locks of navigable canals placed at the lower end of this canal or reservoir, a body of water may be collected and rapidly discharged; by which easy means, not only the channel of the outer drain, but its mouth, if judiciously contracted, may, from time to time, be cleared from obstructions. Where alien waters of a good quality pass through the field of improvement, an embanked channel may be profitably applied in watering the lands; and where alien waters, which have not a natural or fortuitous passage through it can be commanded, and conducted to it at a moderate expense, they may prove highly beneficial, for either or both of these purposes.

SUMMARY. 2. *Of the different Descriptions of Banks in general Use for excluding Waters.*

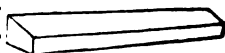
4016. *Mounds or banks for excluding rivers or the sea are generally formed of earth, but sometimes also of masonry and even of wood.*

4017. *The earthen wall (fig. 514.) is the simplest description of embankment, and is frequently erected by temporary occupiers of lands on the general principle of enclosing and subdividing, which is sometimes made a condition of tenure between the landlord and tenant.* This wall applies to lands occasionally, but rarely overflowed or inundated; and is set out in a direction generally parallel to the river or shore. Its base is commenced on the surface from two to five feet wide, regularly built of turf on the outside, with the grassy sides underneath. The middle of the wall is filled up with loose earth. The wall is carried up with the sides bevelled towards the centre, so as to finish in a width of one foot or eighteen inches at five or six feet in height. Collateral to such walls, and at the distance of three or four feet, a small open drain is formed, as well to collect the surface water of the grounds within, as that which, in times



of floods, will necessarily ooze through a wall of this construction. The water so collected is let through the wall by tubes, or tunnels of boards (fig. 515.), with a valve opening outwards on their exterior extremity. When the flow of water from without approaches, it shuts the valve, which remains in this state till the flood subsides, when the height of the water within being greater than that without, it presses open the valve and escapes. Walls and valves of this kind are common enough in the drier parts of the fenny districts of Lincolnshire and Cambridgeshire.

515



4018. *The earthen mound* (fig.

516

516.) is the most general description of embankment, and as it is executed at considerable expense, is only undertaken by such as have a permanent interest in the soil. This barrier applies to sea lands overflowed by every spring tide, and to alluvial plains inundated by every flood. It is set out in a direction parallel to the shore, and to the general turns of the river, but not to its minute windings; and it is placed farther from or nearer to the latter, according to the quantity of water in time of floods, the rapidity of the current from the declivity of the bed, the straight course of the stream, and the intended height of the bank. The two sides of such a mound are generally formed in different slopes. That towards the land is always the most abrupt, but can never be secure if more so than 45° ; that towards the water varies from 45° to 15° ; the power of the bank to resist the weight of the water, as well as to break its force when in motion, being inversely as its steepness. The power of water to lessen the gravity of bodies, or in other words, to loosen the surfaces over which they flow or stand, is also lessened in a ratio somewhat similar.



4019. *The formation of the earthen mound* consists merely in taking earth from the general surface of the ground to be protected, or from a collateral excavation, distant at least the width of the mound from its base line, and heaping it up in the desired form. The surface is then in general cases covered with turf, well rolled in order to bind it to the loose earth. The earth of such mounds is generally wheeled by barrows; but sometimes it is led by carts placed on a wooden roller instead of wheels, which, with the treading of the horses, serves in some degree to consolidate the bank.

4020. *The excavation* serves the same purposes as the open drain in the earthen wall; and similarly constructed sluices or valves are introduced on a larger scale. Sometimes also the interior water is drawn off by windmills, and thrown over the mound into the river. This is very common in Huntingdonshire, and might be greatly improved on by employing steam-engines for entire districts, one of which, of a ten horse power, would do the work of twenty mills, and this in calm weather, when the latter cannot move.

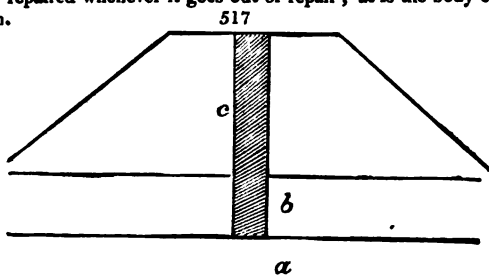
4021. *Embankments of this description* are the most universal of any, and their sections vary from a scalene triangle of ten feet in base, and three feet in height, as on the Forth near Stirling, and the Thames at Fulham, to a base of 100 feet, and a height of ten feet, as in the great bank of the Ouse, near Wisbeach. The great rivers of Germany and Holland are embanked in this way, when so far from the sea as to be out of the reach of the tide; as the Vistula at Marienwerder, the banks of which, near Dantzic, are above fifteen feet in height; the Oder, the Elbe, &c. All these banks are closely covered in every part with a grassy surface, and sometimes ornamented with rows of trees.

4022. *But near the sea, where such banks are washed by every tide* when the course of the wind is towards the shore, and by all land-floods and spring-tides, grass is only to be found on and near their summits. The rest of the bank is bare, and to preserve it from the action of waves, currents, and the stones, pieces of wood, and other foreign matters which they carry with them, the surface is covered with gravel, reeds, or straw, kept down by pieces of wood; faggots, wicker hurdles, nets of straw ropes, straw ropes laid side by side and fastened, or handfull of straw fixed in the ground with a dibber (*Neale's Travels in Germany*, &c. chap. i.), or any other contrivance, according to the situation, to prevent the washing away of the bank. It is common to attribute to these coverings the power of breaking the force of the waves; but this power depends, as we have already stated, on the slope of the bank and its smoothness; and the use of the surface covering, and of the constant attention required to remove all obstacles which may be left on it by floods and tides, is to prevent the loosening power of the water from wearing it into holes. For this purpose, a sheet of canvass or straw-netting is as good, whilst it lasts, as a covering of plate iron or stone pavement.

4023. *All banks whatever require to be constantly watched in time of floods or spring-tides*, in order to remove every object, excepting sand or mud, which may be left by the water. Such objects, put in motion by the water, in a short time wear out large holes. These holes, presenting abrupt points to the stream, act as obstructions, soon become much larger, and if not immediately filled up, turfed over, and the turfs pinned down, or the new turfs rendered by some other means not easily softened and raised up by the

water, will end in a breach of the bank. A similar effect is produced by a surface formed of unequal degrees of hardness and durability. The banks of this description in Holland, at Cuxhaven, and along the coast of Lincolnshire, are regularly watched throughout the year; the surface protection is repaired whenever it goes out of repair; as is the body of the bank in the summer season.

4024. *The mound with puddle wall (fig. 517.)* It generally happens that the earth of such banks is alluvial, and their foundation of the same description; but there are some cases where the basis is sand, silt, or gravel; or a mud or black earth, as in some parts of Cambridgeshire and Lincolnshire, which does not easily become so compact. Here it is common, before beginning



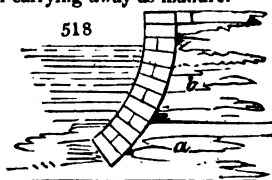
the bank, to bring up what is called a puddle-ditch, or section of clay (a), in the centre of the highest part of the mound in the direction of its length, and of three or five feet wide, according to the depth of the stratum of silt (b), and the intended height of the bank (c). When the clay of this puddle-ditch is well worked, either by men's feet or clay rammers, the bank will be perfectly impervious to water, and if against a mild stream or shore, need not contain such an accumulation of earth as where the imperviousness of the bank to water depends chiefly on the mass of materials. As already observed, the important point to attend to in this variety of mound is, to found the section, or wall of clay, so deep as to be in contact with a stratum (a) either by induration; or its argillaceous nature, impervious to water.

4025. *Mounds with reversed slopes.* In some cases of embanking rivers, as where they pass through parks, it is desirable to conceal, as much as possible, the appearance of a bank from the protected grounds. Hence the mound is simply reversed, the steepest side being placed next the water. It is proper to observe, that such banks are not so strong, by the difference of the weight of the triangle of water which would rest on the prolonged slope, were it placed next the river, and are more liable to be deranged in surface in proportion to the difference of the slopes, the water acting for a longer period on every part of the slope.

4026. *Mound faced with stones.* This is the same species of mound, with a slope next the water of forty-five or fifty degrees, paved or causewayed with stones or timber. In Holland this pavement or causeway is often formed of planking or bricks; but in England generally with stones, and the mortar used is either some cement which will set under water, or, what is better, plants of moss firmly rammed between them. The objection to such banks are their expense, and their liability to be undermined invisibly by the admission of the water through crevices, &c. They are, therefore, chiefly used where there is little room, or where it is desirable to narrow and deepen the course of a river.

4027. *Mound protected by a wicker hedge.* This is a Dutch practice, and, where appearance is no object, has the advantage of not requiring watching. Wicker-work, however, subjected to the strain of waves, will be obviously less durable, than where it lies flat on the ground, and can only decay chemically. This wicker hedge is sometimes a series of hurdles supported by posts and studs; but generally in Britain it is a dead hedge or row of stakes, wattled or wrought with bushes presenting their spray to the sea or river. Besides placing such a hedge before a bank, others are sometimes placed in parallel rows on its surface; the object of which is to entrap sand, shells, and sea weeds, to increase the mass of mound, or to collect shells for the purpose of carrying away as manure.

4028. *The sea wall (fig. 518.)* is an embankment formed to protect abrupt and earthy shores or banks of rivers, and consists of a wall, varying in thickness, and in the inclination of its surface, according to the required height, and other circumstances. Belidor, in his *Traité de Hydraulique*, has given the exact curve which the section of such a wall ought to have (a, b), in order to resist loose earth, and which is somewhat greater than where the earth behind the wall is supposed to be chiefly firm. Some fine examples of such walls, for other purposes, occur in the CALEDONIAN CANAL, and perhaps the finest in the world are the granite walls which embank the Neva at Petersburg, the construction of which may serve as an example of a river cased with stone on a foundation of soft bog earth.



4029. *Embankments for fixing drifting-sands, shells, or mud.* In several tracts of coast, the sea at ordinary tides barely covers a surface of sand; and these sands in dry weather, during high winds, are drifted and blown about in all directions. Great part of the north shores of the Solway Frith, of Lancaster Bay, and of the coast of Norfolk, is of this description. Young, in his *Farmer's Letters*, informs us, that a considerable part of the county of Norfolk was drift sand, even as far inland as Brandon in Suffolk, before the introduction of the turnip culture; and Harte (Essay I.) states that some of what is now the richest land in Holland, was, about the middle of the sixteenth century, of this description. The suggestion of any mode, therefore, by which, at a moderate expense, such tracts could be fixed, and covered with vegetation, must be deemed worthy of notice. The mode which nature herself employs is as follows: After the tides and wind have raised a marginal steep of land as high as high water-mark, it becomes by degrees covered with vegetation, and chiefly by the *elymus arenarius*, *tritium junceum*, various species of *juncus*, and sometimes by the *gallium verum*. With the exception of the first of these plants (the leaves and stalks of which are manufactured into mats and ropes in Anglesea, and the grain of which is sometimes ground and used as meal in Ireland), they are of no other use than fixing the sands, which, being composed in great part of the debris of shells, expand as they decay, and contribute to raising the surface still higher, when the fibrous roots of good grasses soon destroy the others.

4030. *To assist nature in fixing drift-sands*, it is only necessary to transplant the *elymus*, which is to be had in abundance in almost every sandy coast in Britain; and as it would be liable to be blown away with the sands, if merely inserted in the common way, it seems advisable to tie the plants to the upper ends of *willow* or *elder* rods, of two or three feet in length, and to insert these in the sand, by which means there is the double chance of the grass growing, and the truncheon taking root. The elder will grow exposed to the sea breeze, and no plant throws out so many and such vigorous roots in proportion to its shoots.

4031. *The mode by which such sands were fixed in Holland* was by the formation of wicker-work embankments, and by sticking in the sands branches of trees, bushes, furze, &c. in all directions. These obstructed the motion of the sands, and collected masses of sand, shells or mud, and sea-weeds around them, which were immediately planted with some description of creeping grass; or, what was more frequent, covered with a thin coating of clay, or alluvial earth, and sown with clover. Though the most certain and least expensive mode of gaining such lands be undoubtedly that of seconding the efforts of nature, by inserting bushes, and planting the *elymus* in this way; yet it may sometimes be desirable to make a grand effort to protect an extensive surface, by forming a bank of branches, which might, in a single or several tides, be filled with sand and shells. It is evident, that such a bank might be constructed in various ways; but that which would be most certain of remaining firm, and effecting the purpose, would be one regularly constructed of framed timber, the section of which would resemble a trussed roof; each truss being joined in the direction of the bank by rafters, and the whole inside and surface stuck full of branches. To retain it firm, piles would require to be driven into the sand, to the upper parts of which would be attached the trusses. The height of such a barrier would require to be several feet above that of the highest spring-tides; and the more its width at base exceeded the proportion of that of an equilateral triangle the better.

4032. *A mode suited to a less extensive scale of operation*, is to intersect a sandy shore in all directions, with common dead, or wicker-work hedges, formed by first driving a row of stakes six or eight feet into the ground, leaving their tops three or four feet above it, and then weaving among these stakes, branches of trees, or the tops of hedges. The Dutch are said to weave straw ropes in this way, and thereby to collect mud in the manner of *warping*. This mode being little expensive seems to deserve a trial in favorable situations; and, in so doing, it must not be forgotten, that much depends on the immediate management of the surface, after it is in some degree fixed. In an extensive trial of this sort at present in progress on the west coast of Scotland, under an English gentleman, seeds and roots are baked in a mixture of loam and dung in the gravel, and then formed into masses, and scattered over a sandy surface. These, from their weight, will not, it is thought, be moved by the water or the wind; but becoming more or less covered with sand, the mass will be kept moist, and the seeds and roots will grow, and, fixing themselves in the soil, will in time cover the surface with verdure. The experiment is ingenious, and we hope will be crowned with success.

SECT. II. *Of guarding the Banks, and otherwise improving the Course of Rivers and Streams.*

4033. The subject of *guarding the banks of rivers*, is of considerable interest to the proprietors of lands situated in hilly districts, where, in the valleys and on the hill sides, the streams often produce ravages on the banks, and sometimes change their courses.

4034. The natural licence of rivers, Marshal observes, is not only destructive of

landed property, frequently of lands of the first quality; but is often the cause of disputes, and not unfrequently of legal contentions, between neighboring proprietors. A river is the most unfortunate boundary line of an estate. Even as a fence, unless where the water is unfordable, a river, or rapid brook, which is liable to high floods, is the most tormenting and inefficient. Proprietors have therefore a double interest in accommodating each other, as circumstances may require, with the lands of river banks, so as to be able to fix permanent boundary lines between their properties. When the owners of estates cannot, by reason of entails or settlements, or will not for less cogent reasons accommodate each other, they have a line to tread which they cannot deviate from with prudence, much less with rectitude; namely, that of cautiously guarding their own lands, without injuring those of their neighbors; for a lawsuit may cost ten times the value of the sand banks, and islets of gravel, to be gained by dexterity of management.

4035. *The operations for improving rivers* have for their object that of preventing them from injuring their banks, accelerating their motion, and lessening the space of ground which they occupy, or altering their site. These purposes are effected by piers or guardes for altering the direction of the current; works for protecting the banks; and by changing or deepening the river's course.

4036. *The principles on which these operations are founded* are chiefly two; first, that water like every other body when it impinges on any surface, is reflected from it at a similar angle to that at which it approached it; and, secondly, that the current of water, other circumstances alike, is as the slope of the surface on which it runs. On the first of these principles is founded the application of piers for reflecting currents; and on the second, that of straightening rivers, by which more slope is obtained in a given length of stream, and of course greater rapidity of motion obtained.

SUMMARY. 1. On guarding River Banks.

4037. *A common cause of injury to the banks of rivers* is produced during floods. A tree or branch carried down by a stream, and deposited, or accidentally fixed or retained in its banks, will repel that part of the stream which strikes against it, and the impulse (contracted more or less by the general current) will direct a substream against the opposite bank. The effect of this continual action against one point of the opposite bank is, to wear out a hole or breach; and immediately above this breach it is customary to place a protecting pier to receive the impulse of the substream, and reverberate it to the middle of the general stream. But if this pier is not placed very obliquely to the substream, as well as to the general stream, it will prove injurious to the opposite bank, by directing a subcurrent there as great as the first; and, indeed, it is next to impossible to avoid this; so much so, that Smeaton, in almost every instance in which he was consulted in cases of this sort, recommended removing the obstacle where that could be done, and then throwing loose stones into the breach.

4038. *Injuries by floods*, according to Marshal, are to be remedied in two ways; the one is to sheath the injured banks of the bays (fig. 519 a, b, c), with such materials

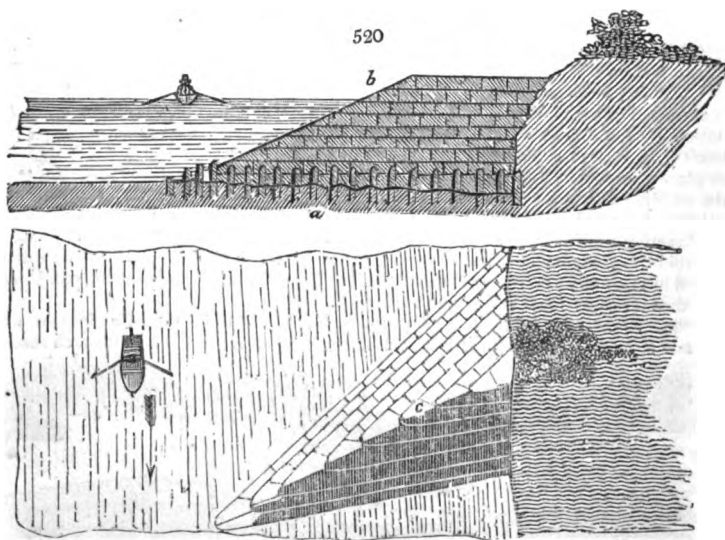


as will resist the circuitous current; and let the river remain in its crooked state. The other, to erect piers (d), to parry off the force of the current from the bank, and direct it forward; with the twofold intention of preventing further mischief, and of bringing back the course of the river to its former state of straightness. It is to be observed, that the operation of guarding the immediate bank of a sharp river bend, against a heavy current meeting with great resistance, by sheathing it with stones, is generally a work of much difficulty and expense, even where materials can be easily procured: while that of diverting the current by a pier may frequently be accomplished at a comparatively small cost; and its effect be rendered infinitely more salutary and permanent. For it is plain, that if the accidental obstruction mentioned, had been timely removed, no bad effect would have ensued: and the river would have continued its direct course. Or if, through neglect, it had been suffered to remain awhile, until its mischief was discoverable; even then, if it had been moved from its station to the opposite side of the river, and placed in the part affected, this small counterpoise might have recovered the balance of the cur-

rent, and directed it into its wonted channel. And in almost any case, by judiciously placing, in a similar manner, a pier or other obstruction proportioned to the magnitude of the power to be counteracted, the like effect may be produced.

4039. *In the use of piers great caution is requisite*, for a very little reflection will show, that they are more likely to increase than to remedy the evil they are intended to cure. We have seen the injurious effects of such piers on the Tay and the Dee; and on a part of the Jed near Crailing they are so numerous, that the stream is, to use a familiar phrase, banded about like a foot-ball, from one shore to the other; behind every pier an eddy is formed, and if the stream does not strike the pier exactly, a breach in the bank takes place. Many of these piers have, in consequence, been taken down. The use of such piers can only be justified where the obstruction, from ill-neighborhood or some such cause, cannot be removed from the opposite bank; or where, as is sometimes the case, it arises from an island of sand or gravel thrown out by the river near its middle, and which, however absurd it may appear, the interested parties cannot agree as to who may remove it. The case of buildings also being in danger, may justify such a pier for immediate protection; but if such breaches are taken in time, a few loads of loose stones dropped in the breach, as recommended by Smeaton, will effect a remedy without the risk of incurring or occasioning a greater evil.

4040. *In the construction of piers*, attention is required to secure the foundation, either by first throwing in a quantity of loose stones, which the water will in a great measure dispose of so as to form a flat surface; or by the use of piles either under, or in single or double rows around those parts of its base in contact with the river. (*fig. 520 a.*) The elevation (*b*), where it is not required to act with great violence on the opposite shore, ought to be bevelled back on all sides exposed to the water, towards the middle of the structure (*c*). In the most important cases stones are the only fit materials, and these



should be regularly jointed and laid in cement according to the best practice of masonry. But, in general, a case of wicker work, of the proper shape, may be filled in with loose stones, some earth, together with the roots of such plants as *tussilago petasites*, *elymus arenarius*, *gallium*, &c. These will form a barrier of considerable durability for some years, and probably till the evil is so far subdued that, when the wicker case decays, its contents will have sufficiently consolidated to effect the object without further care. If not, the wicker case may be renewed. In ordinary cases, a mere wicker hedge projecting into the water will effect the object without further trouble.

4041. *The sheath, or land-guard of loose stones*, which Marshal recommends, and which, in effect, is the mode already mentioned (4037.) as preferred by Smeaton, is applicable to the following cases: First, where the river is confined in the part where it is required to be bent, by rocks or otherwise, to an unaltered channel; as it frequently is, in subalpine situations; and, secondly, where a deep pool occurs, in that part, in low water, so as to render it difficult to get a proper foundation for a pier. Where the foot of the injured bank is covered with a pool at low water, shelve off the brink of the bank, and shoot down loose stones from the top of it; suffering them to form their own slope, in the action of falling, and by the operation of succeeding floods continuing

to pour them down, until the bank be secured, at least from minor floods, and then slope back the upper part, to give freedom to floods of higher magnitude.

4042. *When the channel of a rapid river is narrow and the banks undermined and washed away by the torrents, what Marshal terms the land-guard is to be used.*

4043. *In forming a land-guard for this purpose, he says, the foundation should be laid pretty deep, to guard against any accidental scoopings from the floods. The wall ought to be carried up dry, or without mortar, the stones being laid with their ends outward, their inner ends pointing to the same centre, like those of an arch, and to be backed with gravel, or earth, rammed in firmly behind, as the facing is carried up. The coping or uppermost course of the stones is to be securely bound, with thick tough sods (8 or 10 inches deep), whose surfaces, when beaten down, ought to lie even with that of the stonework; and similar sods require to be laid, with a gently rising slope, until they unite smoothly with the natural turf of the land to be defended; so that the waters of floods, when they rise above the stonework, may have no abruptness to lay hold of, but may pass away smoothly over the surface of the land, as they commonly do over smooth greensward, without injury. Finally, the stones are to be beaten forcibly into the bank, with a rammer, a mallet, or a small battering-ram, adapted to the purpose; thus rendering the whole compact and firm, to resist the current. Where vacancies or fissures still appear, long splinters of stone are to be driven in, as wedges, to increase the firmness, and prevent the current from tearing out an unguarded stone. It follows, in course, that the largest and longest of the stones ought to be used where the greatest resistance is known to be required.*

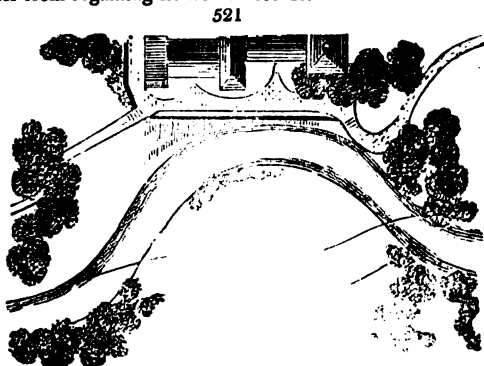
4044. *The repairs of a bulwark of this sort, like every other species of river fence, require to be attended to from time to time, especially after great floods. If the foundation be laid bare, it requires to be re-covered with rough gravel, or with stones thrown loosely against it. If any of the facing stones be displaced or loosened, they are to be replaced with others, or to be wedged in afresh. Or, if the turf which binds them at the top be disturbed, the torn part should be cut out square, and be firmly and completely filled up with fresh turves.*

SUBJECT. 2. *Of Changing the Course of Rivers.*

4045. *A river whose course is in a straight line, or nearly so, hardly ever makes any encroachment on its banks, unless perhaps in very large rivers, when they rise above their usual level, either by an increase in their own waters, or their flow being in some degree interrupted by the tides. Hence, whenever a river is narrow in its channel, and winds considerably, any mischief it commonly occasions may be prevented by deepening and straightening the course of the stream. (Code of Agr. p. 319.)*

4046. *The alteration of the course of a river or brook is attended with difficulty and expense, according to the particular circumstances belonging to it. In a simple case, in which one straight cut only is required, the principal difficulty, and that which requires the best skill of the artist, lies in directing the current of the first flood, out of the old into the new channel. But if a bend of the old channel can be made use of, this difficulty may be said to vanish. The mouth of the new cut receives the current with a straight course; consequently, if it be made of sufficient capacity, the river, in a flood, can have no propensity left towards its old channel: and the loose materials which rise in forming the mouth of the new cut, will generally be sufficient to turn the stream at low water into it. But if a suitable bend cannot be approached by the new cut, a directing pier will be required to bend the flood current, and give it a straightforward course into the new channel: a watertight dam being formed between the point of the pier and the firm bank of the new channel to prevent the water from regaining its wonted course.*

4047. *An entirely new bed or channel, however, is much to be preferred where it can be obtained; for in an altered course, when the stream passes alternately through new soil and through a part of its oldbed, its action on surfaces which are so different in regard to induration ends, if great care is not taken, in holes and gulleys in the new bank, which require to be constantly filled up with loose stones thrown in, and left to be fixed by the pressure and motion of the water. In the case of a river passing near a house (fig. 521.) this is sometimes of*



considerable importance.

4048. *Cutting the new channel* is merely a work of manual labor; being attended with no other difficulty than what may arise from the expense, which will depend on the size of the river, the nature of the ground to be cut through, and the value of labor in the given district. It is mostly to be ascertained with sufficient accuracy by previous calculations. (See 3082.)

4049. *The size of the new cut* may be small, compared with that of the old channel. For the current of floods, by carrying off the earthy particles with which they come in contact, will soon enlarge it. It is nevertheless right to give ample room in the new channel, lest the first flood should prove high, and, by bursting its bounds, force its way back to its former course.

4050. *A new river course* requires to be carefully attended to, during a few years after it is opened, — to see that its channel preserves its straightness, and that no breaches are made or threatened in its banks. Considering the uncertainty of extraordinary floods, it cannot be said to be out of danger in less than three years; hence it becomes prudent, when a work of this nature is contracted for, or undertaken to be done by measurement at an estimated price or prices, previously agreed upon (as it generally ought), that the undertaker should agree to preserve the straightness of the channel, and uphold its banks, during that or some other time fixed upon; and to deliver them up at the end of the term, in the state and condition specified in the contract.

4051. A case of *straightening the course of a river* is given in *The Code of Agriculture*. The waters, which in their crooked course were formerly almost stagnated, now run at the ordinary rate of the declivity given them. They never overflow their banks. Cattle can now pasture upon those grounds in which they would formerly have been swamped. The surface of the water being now in general four, and sometimes six feet, below that of the adjacent fields, this cut serves as a general drain to the whole valley; so that three hundred acres of meadow may be converted into arable land; sixty acres of moss may be improved into meadow; and five hundred acres of arable land are rendered of double their former value. (p. 319.)

CHAP. III.

Of Irrigation or the Improvement of Culturable Lands and Farmeries, by the Means of Water.

4052. *The improvement of lands by water* is of three kinds: — irrigation, or the application of water to the surface of the soil, and especially of grass lands, as a species of culture; warping, or the covering the soil with water to receive a deposition of earthy matter; and the procuring or preserving of water by wells, reservoirs, and other means, for the use of farmeries, live stock in the fields, or the domestic purposes of the farmer or cottager.

SECT. I. *Of Irrigation or the Preparation of the Surface of Lands for the profitable Application of Water.*

4053. *Irrigation* in its different forms may be considered an operation of culture as well as of permanent improvement. It is accordingly in many cases effected by tenants, but always, as in the case of improving wastes, in consequence of extraordinary encouragement from the landlord, by long leases, money advanced, or other advantages.

4054. *The application of water to the surface of lands* for the purpose of promoting vegetation has been practised, as we have seen (180.), from the earliest ages in warm countries. It is an essential article for the culture both of the cereal and pasture grasses, and indeed of most herbaceous crops in all the tropical climates, and even in a great degree in the south of Europe. In the greater part of Italy and Spain, few crops are raised without being irrigated; and even in the south of France, potatoes, maize, madder, and sometimes vines, and orange trees, (as at Hieres,) have water applied to their roots, by furrows and other gutters and trenches formed on the surface. The system of watering grass lands was revived in Italy in the ninth century, and seems to have been practised in a few places in Britain from the time of the Romans; there being meadows near Salisbury which have been irrigated from time immemorial. In 1610, the public attention was called to it by Rowland Vaughan, in a work entitled, "*Most improved and long experienced Water Works; containing the manner of summer and winter drowning of meadow and pasture, by the advantage of the least river, brook, fount, or water mill adjacent; thereby to make those grounds (especially if they be dry) more fertile ten for one.*"

4055. *But the principal efforts in watering lands have been made during the latter end of the last, and beginning of the present century, in consequence of a treatise on the subject by George Boswell, published in 1780; and various others by the Rev. Thomas Wright, of Auld, in Northamptonshire, which appeared from 1789 to 1810. The practice, however, has been chiefly confined to England, there being a sort of national prejudice, as Loch has observed (Improvements on the Stafford Estates, &c.), against the practice in Scotland, though its beneficial effects may be seen as far north as Sutherland, where rills on the sides of brown heathy mountains, never fail to destroy the heath plants within their reach, which are succeeded by a verdant surface of grasses. A valuable treatise on the subject of irrigation in Scotland, by Dr. Singer, will be found in The General Report of Scotland, vol. ii. p. 610. In England the best examples of watering are to be found in Gloucestershire and Wiltshire. In our view of this subject, we shall first consider the soils and situations suitable for irrigation, and next the different modes of effecting it, known as flooding, irrigating, warping, irrigation on arable lands, and subterraneous irrigation.*

SUBJECT. 1. *Of the Soils and Situations suitable for the purposes of Watering Lands.*

4056. *The theory of the operation of water on lands we have already developed. It appears to act as a medium of conveying food, as a stimulus, as a consolidation of mossy soils, as a destroyer of some descriptions of weeds or useless plants, and as the cause of warmth at one season, and of a refreshing coolness at another. From these circumstances, and also from what we observe in nature, there appears to be no soil or situation, nor any climate, in which watering grass-lands may not be of service; since the banks of streams between mountains of every description of rock, and in every temperature from that of Lapland to the equator, are found to produce the richest grass. One circumstance alone seems common to all situations, which is, that the lands must be drained either naturally or by art. The flat surfaces on every brook or river, after being covered with water during floods, are speedily dried when they subside, by the retiring of the waters to their channel.*

4057. *The most proper soils for being watered are all those which are of a sandy or gravelly friable nature, as the improvement is not only immediate, but the effects more powerful than on other descriptions of land. There are also some strong adhesive sour wet lands, such as are common in the vicinity of large rivers, which are also capable of being improved by watering, but the beneficial effects are not in such cases so soon produced as on those of the first sort, nor is the process so advantageous to the farmer, on account of the very great expense to which he must, in many cases, be put to by previous draining. There are some other lands, as those which contain coarse vegetable productions, as heath, ling, rushes, &c. which may likewise be much improved by watering. It must be kept constantly in mind in attempting this sort of improvement, that the more tenacious the soil is the greater the command of water ought to be for effecting the purpose, as a stream capable of watering fifteen or twenty acres of light dry land, would be found to be beneficial in but a small degree when applied to watering half the same quantity of cold clayey ground such as in their natural state abound with coarse plants. On all soils of the last kind a considerable body of water is requisite for the purpose of floating them in order to produce much benefit, and where that cannot be procured, this mode of improvement will seldom answer the farmer's intention or be advantageous in the result.*

4058. *Smith, an experienced irrigator, supposes that "there are only a few soils to which irrigation may not be advantageously applied: his experience, he says, has determined, that the wettest land may be greatly improved by it, and also that it is equally beneficial to that which is dry." (Obs. on Irrigation, &c.) But that as many persons unacquainted with the nature of irrigation may be more inclined to the latter supposition than the former, he explains the reason of wet land being as capable of improvement from flooding as that which is completely dry before. It is that in the construction of all water meadows, particular care must be taken to render them perfectly dry when the business of floating shall terminate; and that the season for floating is in the winter and not the summer, which those who are unacquainted with the process have too generally supposed. All peat bogs are certainly of vegetable origin, and those vegetables are all aquatic. It follows that the same water which has produced the vegetables of the bog would, under due management upon the surface, produce such grasses, or other vegetables, as are usually grown by the farmer; and he has hitherto had reason to think, that this may be considered as a general rule for determining the situation of any experiments with water. The lands that permit of this sort of improvement with the most success are such as lie in low situations on the borders of brooks, streams, or rivers, or in sloping directions on the sides of hills.*

4059. *The quality of the water, like that of marl or other manures, is supposed by some to be a matter of the first importance; but it is now fully proved, by the accurate*

experiments of an able chymist, and by the extraordinary growth of grasses in Pristley meadow, in Bedfordshire, that ferruginous waters are friendly to vegetation, when properly applied. (*Smith's Observations on Irrigation*, p. 28.) Lead or copper never does good, and it is well known, that waters of that description, after they have been brought into fields, by levels cut at a considerable expense, have again been diverted, and suffered to flow in their original channels. Waters that are impregnated with the juices that flow from peat-mosses, are considered by many not worth applying to the soil. It is objected to them, that they are soon frozen; that they convey no material nutriment; and that they are commonly loaded with such antiseptic substances, as will retard, instead of promoting vegetation. (*Dr. Singer's Treatise*, p. 579.) It is urged, on the other hand, that a want of sufficient slope in the meadow, or of proper management in regard to the water, may have occasioned the disappointments experienced in some cases, when bog-waters have been applied. (*Derbyshire Report*, vol. ii. p. 463.)

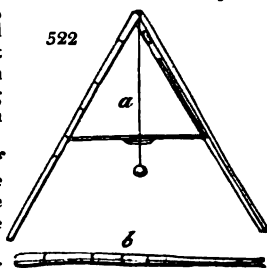
4060. *The advantages of watering lands* must, in a material degree, depend on the climate. It is evident that the benefit to be derived from this process in Sweden for example, where the summers are short, must be greatly inferior to what it is in Lombardy where grass grows all the year; and much less in Perthshire, where grass ceases to grow for at least three, and often four months in the year, than in Gloucestershire or Ireland, where its growth is not interrupted above a month or six weeks, and sometimes not at all: most grasses vegetating in a temperature of 33 or 34 degrees. Still, however, as the most luxuriant pastures are found on lands naturally watered, both in Sweden and Perthshire, it would appear worth while to imitate nature in cold as well as warm countries. According to many writers on the subject, the benefits attending watering in England, are immense. In Davis's *Survey of Wiltshire*, it is calculated that 2000 acres of water meadow will, on a moderate estimate, produce in four or five years, 10,000 tons of manure, and will keep in permanent fertility 400 acres per annum of arable land.

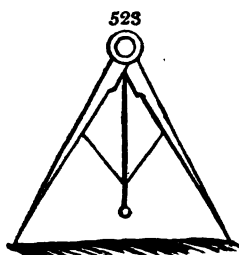
4061. *Watering poor land*, especially if of a gravelly nature, is stated in *The Code of Agriculture* to be by far the easiest, cheapest, and most certain mode of improving it. "Land, when once improved by irrigation, is put in a state of perpetual fertility, without any occasion for manure, or trouble of weeding, or any other material expense. It becomes so productive, as to yield the largest bulk of hay, besides abundance of the very best support for ewes and lambs in the spring, and for cows and other cattle in the autumn of every year. In favorable situations, it produces very early grass in the spring, when it is doubly valuable; and, not only is the land thus rendered fertile, without having any occasion for manure, but it produces food for animals, which is converted into manure, to be used on other lands, thus augmenting, in a compound proportion, that great source of fertility." Were these advantages more generally known, or more fully appreciated, a large proportion of the kingdom might become like South Cerney, in Gloucestershire, where every spring, or rivulet, however insignificant, is made subservient to the purpose of irrigation, fertilizing, in proportion to its size, either a small quantity, or a large tract of land. (*Gloucestershire Report*, p. 280.)

SUBJECT. 2. *Of the Implements made Use of in Watering Lands; and of the Terms of Art peculiar to Works of that kind.*

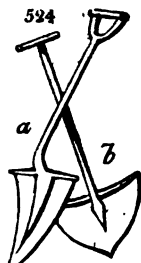
4062. *The principal instrument* made use of in the preparation of lands for watering, is the level, different descriptions of which have already been given. The level is necessarily employed to take the level of the land at a distance, compared with the part of the river, &c. whence it is intended to take the water, to know whether it can or cannot be made to float the part intended to be watered. It is found very useful in undertakings of this nature, especially when on a large scale, though the workmen too frequently dispense with the use of it, bringing the water after them to work by. In drawing a main they begin at the head, and work deep enough to have the water to follow them; and in drawing a tail drain they begin at the lower end of it, and work upwards to let the water come after them. The level should, however, be made use of as being more certain and correct. Brown, an experienced irrigator in the west of England, recommends a level (fig. 522 a), which when not in use may be closed (b) like a walking stick. There is also a compass level (fig. 523.), which may be used in the same way.

4063. *A line and reel, and a breast-plough, or turf spade* (fig. 250.), are likewise absolutely necessary. The use of the two former are well known; but as the line is mostly used in the wet, it should for this purpose be larger and stronger than those employed in gardening. The turf spade should be of the best description, being principally employed in cutting turfs for the sides of the channels.





4064. The spades made use of in this sort of work (fig. 524 a), should have the stems considerably more crooked than those of any other sort; the bit being of iron, about a foot wide in the middle, terminating in a point; a thick ridge running perpendicularly down the middle, from the stem almost to the point; the edges on both sides should be drawn very thin, and as they are obliged to be kept very sharp, they should be often ground and whetted. This necessarily wears them away, and they soon become narrow; they are then used for the narrow trenches



and drains, whilst new ones are used for the wider. From the stems being made crooked, the workmen, standing in the working position in the bottom of the trench or drain, are enabled to make them quite smooth and even. Shovels of different forms (fig. 525 a, b), and a scoop for lifting water (c), are also requisite.

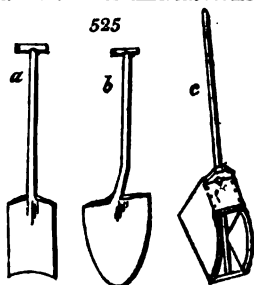
4065. The crescent (fig. 524 b) is another tool made like the gardener's edging iron, only much larger, having the form of a crescent, being very thin, and well steeled, with a stem about three feet long, and a cross handle to bear upon. It is used for tracing out the sides of the mains, trenches, drains, &c.

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4066. The turf knife (fig. 526.) has a scymer-like blade, with a tread for the foot (a) and a bent handle (b); it is used for the same purpose as the crescent, and by some preferred.

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4067. Wheelbarrows also become necessary to remove the clods to flat places; which may be open, without sides or hinder parts.

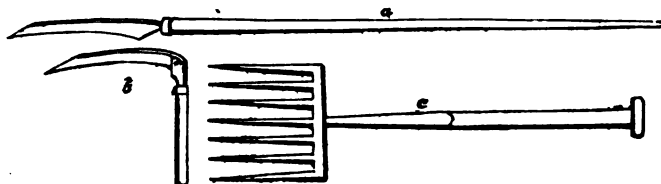
4068. Handbarrows are likewise sometimes made use of where the ground is too soft to admit of the wheelbarrows, and where clods require to be removed during the time the meadow is in water.

4069. Three-wheel carts, &c. are, however, necessary, when large quantities of earth are to be removed, particularly when it is carried to some distance.

4070. Scythes, of different sorts, (fig. 527 a, b), are required to mow the weeds and grass, when the water is running in the trenches, drains, &c.

4071. Besides these, forks (c), and long four or five tined hacks, are requisite to pull

527



out the roots of the sedge, rushes, reed, &c. which grow in the large mains and drains. The crooks should be made light, and have long stems, to reach wherever the water is so deep that the workmen cannot work in it.

4072. And stout large water-proof boots, having tops so as to draw up half the length of the thigh, are indispensable; they must be large enough to admit a quantity of hay to be stuffed down all round the legs, and be kept well tallowed, to resist the running water for a length of time.

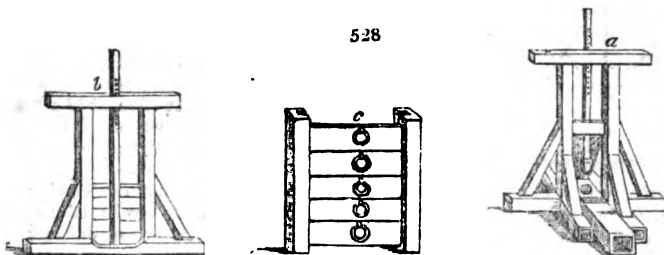
4073. The terms made use of are very different.

4074. A ware is an erection across a river, brook, rivulet, main, &c. made often of timber only, sometimes of bricks, or stones and timber, with from two to eight, or ten thoroughs (openings) to let the water through, according to the breadth of the stream. Its height is always equal to the depth of the stream compared with the adjacent land. Its use is, when the hatches are all in their proper places, to stop the whole current, that the water may rise high enough to overflow the banks, and spread over the adjoining

land; or, by stopping the water in its natural course, turn it through mains, cut to convey it another way, to some distant lands, to water them.

4075. *A sluice* (fig. 528 a, b) is made exactly as a ware, only it has but one thorough; for if there are more than one, it becomes a ware.

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4076. *A trunk* is a covered sluice, being constructed in all cases where two streams of water are to cross each other at the point of discharge, to serve as a bridge.

4077. *A carriage* is a sort of small wooden or brick aqueduct, built open, for the purpose of carrying one stream over another, and is the most expensive conveyance belonging to the business of watering.

4078. *A drain sluice, or drain trunk*, signifies such as are placed in the lowest part of a main, as near to the head as a drain can be formed, and situated low enough to drain the main, &c. It is placed with the mouth at the bottom of the main, being let down into the bank; and from its other end a drain is cut to communicate with some trench-drain that is nearest. It is a contrivance used to carry off the leakage through the hatches when they are shut down, to convey the water to other grounds, or to repair the main, &c.

4079. *Hatches*, (fig. 528 c) are floodgates, variously constructed. A particular kind, which have about a foot, to take off, so as to permit the water to flow over that much of the hatch where it appears to be useful in irrigation has been in use, but is not found to answer. They are best when made whole; they may be made of any timber, but oak and elm are the best.

4080. The term *head main* is used to signify a ditch drawn from the river, rivulet, &c. to convey the water out of its usual current to water the lands laid out for that purpose, through the means of lesser mains and trenches. The head main is drawn of various breadths and depths, according to the quantity of land to be watered; to the length, or to the fall or descent of the land it is cut through. And it often happens that smaller mains are taken out of the head main; the only difference between them is, the one being much less than the other, and are mostly cut at, or nearly at, right angles with the other, though sometimes many degrees less. The use of both the large and small mains is to feed the various trenches with water, which branch out into all parts of the meadow, and convey the water to float the land. These smaller mains are by some called carriages, but improperly, for it is confounding them with the open trunk, called by that name, as seen above.

4081. *The trench* is a narrow shallow ditch, made to take the water out of the mains to float the land with. It ought always to be drawn in a straight line from angle to angle, with as few turnings as possible. It is never made deep, but the width is in proportion to the length it runs, and the breadth of the pane, between that and the trench drain. It is always cut gradually narrower and narrower to the lower end.

4082. *The trench drain* is cut parallel to the trench, and as deep as the tail drain water will admit when necessary. It ought always to be cut, if possible, so as to come down to a firm stratum of sand, gravel, or clay. If the latter, a spade's depth into it will be of great advantage; its use is to carry away the water immediately after it has run over the panes from the trench. It need not be drawn up to the head of the land, by five, six, or more yards, according to the nature of the soil. Its form is the reverse of the trench, being narrower at the head, or upper part, and gradually wider and wider, till it comes to the lower end and empties itself into the tail drain, which is a receptacle for all the water that runs out of the other drains, that are so situated as not to empty themselves into the river; and therefore it should run nearly at right angles with the trenches, but, in general, the preference is given to draw it in the lowest part of the ground, and to use it to convey the water out of the meadow where there is the greatest descent; this is generally found in one of the fence ditches: for which reason a fence ditch is mostly used for that purpose, answering two purposes, fencing the meadow, and draining it at the same time.

4083. *A pane of ground* is that part of the meadow which lies between the trench and the trench drain, and is the part on which the grass grows that is mown for hay; it is wa-

tered by the trenches and drained by the trench drains, consequently there is one on each side of every trench. And a way pane is that part of the ground which lies in a properly watered meadow, on that side of a main where no trenches are taken out, but is watered the whole length of the main over its banks; a drain runs parallel with the main to drain the way pane; its use is for a road to convey the hay upon out of the meadows, instead of the teams crossing all the trenches.

4084. The term *bend* is applied to a stoppage made in various parts of those trenches which have a quick descent, to obstruct the water. It is made by leaving a narrow slip of greensward across the trench, where the bend is intended to be left, cutting occasionally a piece, wedge fashion, out of the middle of it. Its use is to check the water, and force it over the trench into the panes; which, if it were not for those bends, would run rapidly on in the trench, and not flow over the land, as it passes along. The great art of watering meadows consists in giving to every part of each pane an equal quantity of water.

4085. A *gutter* is a small groove cut out from the tails of those trenches, where the panes run longer at one corner than the other. Its use is to carry the water to the extreme point of the pane. Those panes which are intersected by the trench and tail drains meeting in an obtuse angle, want the assistance of these gutters to convey the water to the longest side. Another use of them is, when the land has not been so well levelled but some parts of the panes lie higher than they ought, a gutter is then drawn from the trench over that high ground, which otherwise would not be overflowed. Without this precaution, unless the flats were filled up (which ought always to be done when materials can be had to do it), the water will not rise upon it: and after the watering season is past, those places would appear rusty and brown, whilst a rich verdure would overspread the others; and at hay-time the grass in those places would be scarce high enough for the scythe to touch it, whilst that around them, which has been properly watered, will from its luxuriance lie down. Though this method of treating those places is mentioned, it ought always to be reprobated; for every inequality in water meadows should either be levelled down or filled up. Here the irrigator's skill is shown, in bringing the water over those places where it could not rise of itself, and in carrying it off from others where it would otherwise stagnate.

4086. The term *catch drain* is sometimes applied to another method made use of to water the land when the water is scarce, and it is this: when a meadow is pretty long and has a quick descent, the water runs swiftly down those drains, one or more of them are, at a proper place, close stopped, till the water flowing thither rises higher and higher, either till it strikes back into the tail drains, so high as to rise upon the sides of the panes (in that case it will not succeed, and must be cut open again to let the water free), or till it flows over the banks of the drain, and waters the ground below; then the design succeeds, and (in proportion to the quantity of water thus collected) it is to be conveyed upon the land, either in a small main, out of which trenches are to be drawn with their proper drains, or by trenches taken immediately out of it. But a catch drain is by no means recommended; and it is proper to remark, that even when this method succeeds, the water having been so lately strained over the ground, it is supposed by the watermen to be not so enriching as it was before it was used, and therefore nothing but absolute necessity can justify its adoption.

4087. The *bed* of a river, main, trench, &c. is the bottom of them.

4088. The term *pond* means water standing upon the land, or in the tail drain, trench drains, &c. so as to injure the ground near them; and is occasioned sometimes by the flats not having been properly filled up; and at other times, when a ware being shut close, to water some high ground above it, the water is thrown back upon the ground contiguous. In this case the lesser evil, whichever it is, must be borne with.

4089. And a *turn of water* means so much land in a meadow as can be watered at one time. It is done by shutting down the hatches in all those wares where the water is intended to be kept out, and opening those that are to let the water through them. The quantity of land to be watered by one turn, must vary with the size of the river, main, &c. as well as with the plenty or scarcity of water.

4090. The *head* of a meadow is that part into which the river, main, &c. first enters; and the tail of a meadow is that part out of which the river, &c. last passes.

4091. The *upper side* of a main, or trench, is that side which (when the main or trench is drawn at, or nearly at, right angles with the river, &c.) fronts the part from whence the river entered. Consequently the lower side is the reverse.

4092. And the *upper pane* in a meadow is that pane which lies upon the upper side of the main, or trench, that is drawn at right angles with the river: that is, when the river, &c. runs north and south, entering at the north, and the mains and trenches are drawn east and west, all those panes, which lie on the north side of the main, &c. are called the upper panes, those on the south side are called the lower. But it may be noticed, that where the mains, trenches, &c. run parallel with the river, the panes on either side are not distinguished from each other.

4093. *Meadows are of two sorts*; flowing, calculated for a flat country; and catch-work, for sloping grounds.

4094. *Flowing meadows.* Where the ground is flat, the soil is formed into beds, or broad ridges, like those met with at bleach-fields. They are commonly from 30 to 40 feet wide, and nine or ten poles in length; as, in such situations, the great object is, when once brought on, to be able to carry off the water quickly. Hence it is necessary to throw up the land in high ridges, with drains between them. More of the failures in irrigation arise from the ridges not being sufficiently high, and the slopes not being sufficiently steep, than from any other cause. (*Code.*)

4095. *Catch-work meadows.* It is difficult to give an intelligible written description of the mode of making these meadows. To be properly understood, the operation must be seen. It may, however, in general be remarked, that the system is calculated for sloping grounds; and that after the water is brought from the original stream, into a new cut, it is stopped at the end, on as high a level as the case admits of, by which the water is made to fill the trench, and run over at the side, and flood the land below it. But as the water would soon cease to run equally, and would wash the land out in gutters, it has been found necessary to cut small parallel trenches, at the distance of from 20 to 30 feet, to catch the water again (hence the name originated), and the same plan of spreading or diffusing is continued, until the water reaches the main drain at the bottom of the meadow. It is a great advantage attending the catch-work system, that it is not only less expensive, but the same quantity of water will do much more work. (*Code.*)

SUBJECT. 3. *Of the Preparation of Surfaces for Irrigation.*

4096. *Artificial irrigation,* Smith observes, is produced by diverting the water of a brook out of its accustomed channel (where there is a fall) in such a manner that the new watercourse being kept nearly level, the space between the old and new channel may be floated; the water being brought upon the land by the new channel and taken away to the old one. Thus a constant discharge and succession of water is retained without such an accumulation as would make it appear bright upon the land, or without such a deficiency as would leave any part of it not perfectly floating, for the art of irrigation may be most properly called floating, not soaking nor drowning. Soaking the soil, similar to the effects produced from a shower of rain, is not sufficient for the general purposes of irrigation, nor will damming up water and keeping it stagnant upon the surface like that in a pond, or on the fens, produce the desired effect.

4097. *Stagnating water on land* may properly be called drowning, because it drowns or covers all the grass, thereby rendering the plants beneath it in some degree aquatic, or the herbage disposed to make such a change; whereas the herbage of a water meadow should, by the construction and good management of the latter, enjoy the full benefits of both the elements of air and water. Practice has proved that there is no better method of doing this, than by keeping water passing over the surface of the land with a brisk current; not so brisk as to wash away the soil, and yet in sufficient quantity to cover and nourish the roots, but not too much to hide the shoots of the grasses: hence appears the nicety of adjusting the quantity of water; and hence it also appears, that one main drain to bring the water on the upper side of the mead, and another on the lower side to take it away, will not be adequate to all the purposes of such an accurate regulation. If the space between the upper channel or main feeder, and the lower one or main drain, should therefore be wider than is proper for the good adjustment of the water, that is, so that every part of the space shall have enough water passing over it and no part too much, then that space must be divided into smaller spaces by intermediate drains, which shall catch and re-distribute the water. As the water is brought by the main feeder upon the higher side of a piece of ground which slopes towards the main drain, and down which sloping surface the water will run very readily, it does not to persons unacquainted with irrigation, at first sight appear necessary to make such a number of intermediate catch drains; but it is proved by experience, that however regular the slope of ground may appear to the eye, that the water will find a number of irregularities, forcing itself into gutters or channels, and defeat the purposes of irrigation; in the hollow places by excess, and in high ones by the want of water. Hence the water, which was scattered over the surface of the first space, being all collected in the catch drain, may by the skill of the floater be let out upon those parts of the bed below which appear to need the most assistance.

4098. *The work should always be well formed at first* in all cases of improvements of this nature. Temporary means of making dams and hatches to divert the water out of its usual channel may, says Smith, "suffice to try an experiment, or for a tenant who has but a short term in the grounds to be irrigated; but every land-owner who enters upon such work in this temporary manner, sadly mistakes his own interest; indeed it is frequently more difficult to repair than to renew upon large streams when the foundations are often destroyed by the force of the water. The same principle holds good upon

small streams, and even in the drains and feeders of a water meadow. Wherever the channels are so constructed as to make a fall, or much increase the rapidity of the stream, it is constantly disposed to wear away the sides of its channel or undermine a dam. To repair these defects, land must be dug away and wasted each time it is replaced with the loss of labor. The consequent ill management of the water renders it more advisable, and perhaps cheaper, to make all such works of masonry. When works are well done at first the owner ever finds much pleasure in viewing them; and even the laborers feel much more interested in their good management.

4099. *The expenses of making a water meadow* are not easily estimated. Much depends on the original state of the ground, the size and fall of the streams to be used, the cost of hatches and length of the main feeders, which may be necessary for diverting the water out of its original channel, and even upon the charge for levelling land, which differs materially. Some soils are much harder and more difficult to move than others, and in certain situations, building materials are very scarce and dear. This last circumstance must make a considerable variation in the price of the hatches, where the stream is large. It is also impossible to tell with any degree of certainty, what proportion these expenses should bear to the quantity of land irrigated, for some situations will require much more masonry than others.

4100. *Before entering upon the execution of a water meadow*, it is necessary to consider fully, whether the stream of water to be made use of will admit of a temporary wear or dam to be formed across it, so as to keep the water up to a proper level for covering the land without flooding or injuring other adjoining grounds; or if the water be in its natural state sufficiently high without a wear or dam; or to be made so by taking it from the stream higher up more towards its source; and by the conductor keeping it up nearly to its level till it comes upon the meadow or other ground. And still further, whether the water can be drawn off the meadow or other ground in as rapid a manner as it is brought on. And having in addition to these an attention to all such other difficulties and obstructions as may present themselves, from the lands being in lease through which it may be necessary to cut or form the mains or grand carriers, from the water being necessary for turning mills, from the rivers or brooks not being wholly at the command of the irrigator, and from small necks of land intervening, so as to prevent the work from being performed to the greatest advantage, the operator may be in a situation to commence his operations.

4101. *In order to have an equal distribution and prevent waste*, Smith states, that no part of a meadow, either in catch-work or beds, should be so formed as to be floated directly from the main feeder; but all the main feeders should be kept high enough to discharge the water into the small feeders with considerable velocity and through a narrow opening. The motion of water is truly mechanical; it requires a great deal of ingenuity, and a perfect knowledge of lines and levels to make it move over the ground in a proper manner. No two pieces of land being exactly alike, renders it still more difficult to set out a water meadow; but even if the figure of two pieces be alike, the inequalities of surface will probably vary. Each meadow, therefore, requires a different design, unless the land owner makes up his mind to the heavy expenses of paring off banks, and filling up such hollows as may be necessary to reduce it to some regular method. The construction to be varied according to the nature of the ground. This constitutes the difference between the water meadows of Berkshire and Devonshire. Those of the latter are upon small streams carried round the sides of the hills, and are chiefly catch-work; those of the former being near large rivers and boggy ground, are thrown up into ridges to create a brisk motion in the water, and also for the essential purpose of draining off all superfluous moisture, which might be injurious to the grasses when shut up for feeding or mowing. Where there is much floating to be done with a little water, or rather where the great fall of a small stream will admit of its being carried over a vast quantity of ground and used several times, it is desirable to employ it in such a way that the meadows so irrigated must not be exhibited as perfect models. If it should answer the purpose of a coat of manure upon such an extent of ground, it is all that can be expected, and will amply repay the expense. Losing fall is wasting water.

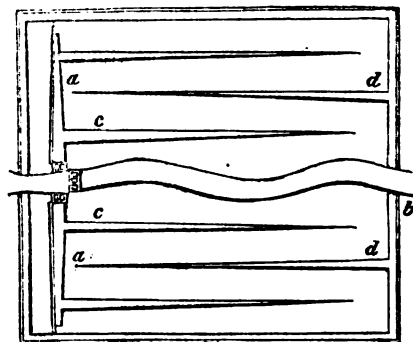
4102. *The drains of a water meadow* require no greater declivity than is necessary to carry the water from the surface, therefore the water ought to be collected and used again at every three feet of the fall, if it be not catch-work. It is sometimes difficult to do this in bed-work meads, but where the upper part of the meadow is catch-work or in level beds, and the lower part not too much elevated, it may be done. By collecting and using the water again in the same piece of ground before it falls into the brook, a set of hatches is saved, and it is not necessary to be very particular about getting the upper part into high ridges, since that part of the meadow which is near the hatches generally becomes the best, and the lower end of the field being often the wettest or most boggy in its original state, requires to be thrown up the highest. If the land is of a dry absorbent

nature before floating, it is not necessary that it should be thrown up into high beds, but merely as much inclined as will give the water a current.

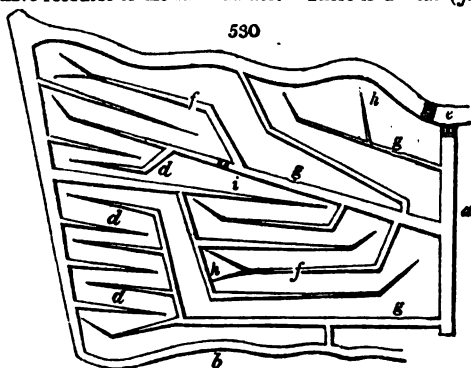
4103. *Inclined planes are absolutely necessary for the purpose of irrigation.* To form these between straight and parallel lines, it is necessary to dig away land where it is too high, and move it to those places where it is too low, to make such a uniformity of surface. The new made ground will of course settle in hollows proportioned to the depth of loose matter which has been recently put together, but this settlement will not take place until the new soil has been completely soaked and dried again; therefore these defects cannot be remedied before the second or third year of watering: it will then require more skill to manage a water meadow for the three or four first years, than it can afterwards.

4104. *Properly to construct a water meadow is much more difficult than is commonly imagined.* It is no easy task to give an irregular surface that regular yet various figure which shall be fit for the overflowing of water. It is very necessary for the operator to have just ideas of levels, lines, and angles; a knowledge of superficial forms will not be sufficient; accurate notions of solid geometry (obtained from theory or practice) are absolutely necessary to put such a surface into the form proper for the reception of water without the trouble and expense of doing much of the work twice over. (*Obs. on Irrigation, &c.*)

4105. *As an example of irrigating a meadow from both sides of a river we take the following case from Boswell's treatise.* From the upper part of the grounds, two main drains (fig. 529 a, a) are formed at right angles to the river, one running north the other south, across the meadow, to within about six yards of the fence ditches which surround it (b), and are used for tail drains: by means of these fence ditches the water is discharged into the river. A wear erected across the river forces the water into either of the main drains, which is done by shutting the other wear close. When there is not water enough, or it is not convenient to water both parts of the meadow at once, by shutting close one of the wears, the current is forced into that main whose wear is open, thence to be conveyed through the trenches over the panes, to water that side of the meadow; then by shutting that, and opening the other, the opposite main is filled, and by means of the trenches that side of the meadow is watered in the same manner; and lastly, by shutting them both, and opening the river wear, the water flows in its usual course, and the land on both sides is laid dry. From the main drains (a, a) the water flows along the highest part, or crowns of the ridges in the trenches (c), and is carried off to the tail drains by the trench drains (d).



4106. *As an example of an irregular surface watered from one side of a river, we shall have recourse to the same author.* There is a wear (fig. 530 e) erected across the river,

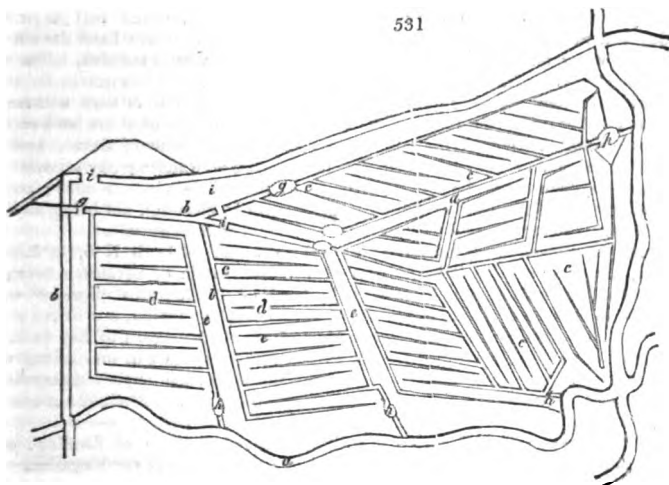


(f, f), and various gutters (h, h), taken out of the ends of some of the trenches, to carry

and another across the head-main (a), from which proceed three main and branch trenches (g, g, g, and f, f), which water the whole meadow. There is a tail drain (b) for carrying off the whole of the water by means of the drain trenches (d, d). The water having thus passed over the field, is returned to the river by the tail drain, already mentioned. When it is desired to withhold the water, the wear of the head main (a) is shut, and that of the river (e) opened. It will be observed, that in this design there are branch trenches

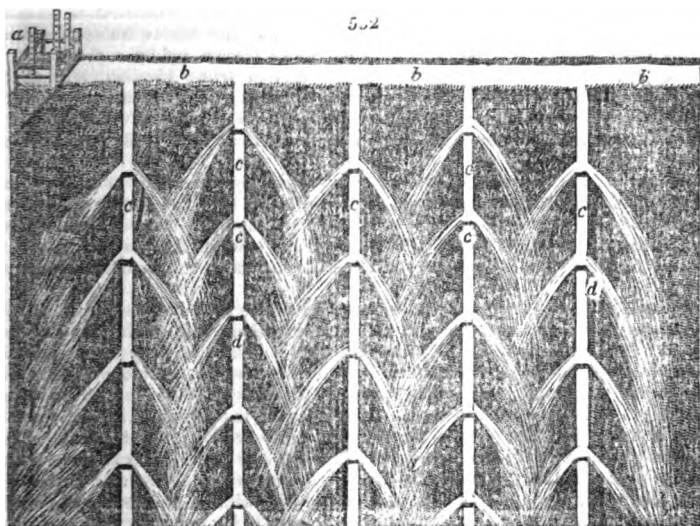
the water to the longest corner of the panes, and sometimes taken out of different parts of the trenches, to water some little irregularities in the panes, which, without such assistance, would not have any water upon them. There is a sluice (i) erected at the end of one of the small mains, to force the water into the branch trench adjoining (f), that being the highest ground.

4107. A very complete piece of irrigation (fig. 531.) was formed for the Duke of Bed-



ford, by Smith, at Pristley. The water is supplied from a brook (a), to a main feeder with various ramifications (b, b), the surface is formed into ridges (c, c), over which the water flows, and is carried off by the drains in their furrows (d, d), to the main drains (e, e), and to the brook at different places (f, f, f). There are bridges (g) over the main feeders, small arches over the main discharging drains (h), and three hatches (i).

4108. As an example of catch-work watering, we may refer to a case (fig. 532.), given



is a recent work by John Brown. (*Treatise on Irrigation*, 1817.) In this the field of operations being on the steep side of a hill, a main carrier is led from the sluice (a), directly across the declivity (b), and lateral feeders (c) taken out from it at regular distances. These feeders have stops of turf, at regular distances (d), by which means the water is dispersed. After watering a space of from twenty to forty feet in breadth, it

is again collected by the small drains in the furrows, and returned lower down to another feeder. The advantage of this method, Browne observes, "relates more materially to the sides of hills, and to porous soils that are by some thought incapable of being watered. The chief point is to get the water to the highest level possible; and in case the soil be porous, one main carrier only will require puddling, in order to prevent the water from sinking away: when that is done, no difficulty whatever is found in taking it in small streams vertically, or directly down the slope (c), and putting stops (d) to arrest its progress occasionally, which will throw it on each side; and when those stops are placed one above another, it will have the effect of spreading the water on the land, somewhat similar to a fan when extended. The stops need only be sods or turfs, one laid lengthways in the gutter, and one across it, which may be raised or lowered according to the declivity: these sods or turfs will require probably a small wooden peg to fasten them at first; and by the time the land requires a second watering, the roots of the grass will have sufficiently fastened them; and they need not be removed, unless occasionally for the purpose of watering any separate part below, when the stream may be too small to water the whole piece at once; and the small cuts for conveying the water will be less expensive in cleaning, not being so liable to choke up as those carried on what is termed horizontal or level gutters.

4109. *As an example of the benefit of flooding*, we refer to Loch Ken, in Kircudbrightshire, the most striking instance known in Great Britain of advantage being derived from the inundations of a lake. At the head of that beautiful piece of water, there is a flat of about 240 statute acres, which is rendered, by flooding, one of the richest spots in Scotland. Many acres in it produce at the rate of three tons of hay each, and some parts of it have been cropped with grain for twenty-five years in succession, without any manure, except what it receives from the inundations it experiences. These, however, leave behind them a variety of enriching substances. (*Statistical Account of Scotland*, vol. iv. 260.)

4110. *Floating upwards*. The ancient and now obsolete practice of flooding, or, as it was termed, of floating upwards, was practised in various parts of the kingdom. For that purpose, the water was penned, in times of floods, by means of a dam or floodgate across the bottom of the meadow or flat to be watered. The waters were not suffered to remain long upon the land, but were let off as soon as it was judged that they had deposited their sediment. The benefit arising from this method of using floodwaters, it is said, was considerable; but when the improved mode of irrigation, by floating ridges was introduced, and found more advantageous, the other was discontinued. (*Marshall's Midland Counties*, Minute 27.)

4111. *Watering land by machinery*. If the land be put in a proper form for irrigation, and supplied with a good stream at proper seasons, there can be no difference from the method of getting it on the surface; and if all other circumstances are equally favorable, the same fertility may be expected from water thrown up by a drain-mill, as that which runs from a brook. (*Smith's Observations on Water Meadows*, &c. p. 93.) A cheap and effectual power for raising water in sufficient quantities to flow about ten acres at a time, would be an invaluable acquisition; for a productive water meadow is probably the true mark of perfection, in the management of a farm. (*Middlesex Report*, p. 322.)

4112. *Sea water*. Smith suggests the idea of employing machinery, to raise not only fresh, but even sea water, for irrigation. (*Observations*, p. 87.) It is well known, how much all kinds of stock are improved by salt marshes, and how beneficial to them, is a moderate quantity of saline matter. There are many parts of the kingdom where, by the aid of machinery, these advantages might be obtained at a moderate expense. (*Code*.)

4113. *The expense of irrigation varies according to the nature of the work*. Where the catch-work system is practicable, in favorable situations, the forming may be done as low as ten shillings per acre. This fact is, in many cases, decisively in favor of this natural and simple mode, which requires also much less water, and often answers fully as well as flat flooding. (*General Report*, vol. ii. p. 598.) The expense of bed-work, as it is called, is, however, considerable. If the ground to be flooded, be smooth on its surface, or in regular ridges, and if the water can easily be brought to the meadow, with a temporary wear, supposing the extent to be almost twenty acres, it may be done at from 5*l.* to 10*l.* per acre; but if the land be of large extent, with an irregular surface; if a large conductor, and a proper wear shall be required, with hatches both in it, and also in the feeders; and if the aid of a professional person, to lay out and oversee the work, be necessary, (which is generally the case), the expense will vary from 10*l.* to 20*l.* per acre. (*General Report*, vol. ii. p. 598.) Nay, in Wiltshire, where they are anxious to have their meadows formed in the most perfect manner, with that regularity which the nice adjustment of water demands, the expense per acre has amounted to 40*l.* (*Smith's Observations on Irrigation*, p. 56.)

4114. *Objections to irrigation* have been made on the supposition that it renders a country unhealthy; but as the water is continually kept in motion, this is not likely to be the case, and indeed is found not to be so in Gloucestershire, Lombardy, and other countries where it is extensively practised. Others think that though the produce may be increased, it becomes in a few years of so course a nature, mixed with rushes, and water plants, that cattle frequently refuse to eat it, and when they do, their appearance proclaims that it is far from being of a nutritious quality. (*Rutland Report*, p. 114.) But this objection is never applicable to meadows skilfully made, and properly managed; and whenever the grasses are coarse, they should be cut earlier if intended for hay. Rushes and water plants are proofs that the meadow lies too flat and is ill managed. (*Code*.)

4115. *The principal impediments to irrigation* are the claims of different individuals on one stream, as millers, canal owners, &c.; the intermixture of property and interests; and the existence in some cases of adverse leases.

4116. *The formation and arrangement of surfaces* for irrigation, however simple in principle, is in practice one of the most difficult operations of agricultural improvement. Whoever, therefore, contemplates extensive and intricate works of this kind, will find it desirable to call in the assistance of a professor and contractor of reputation. In Gloucestershire there are a class of men known as "flooders," who have under them a company of men accustomed to every part of the work, and who accompany their chief to execute works in any part of the country.

SECT. II. *Of Warping, or the Improvement of Land by Muddy Water.*

4117. *Warping* is a mode of fertilizing lands by depositing a coat of mud on their surface. This may be practised on the borders of large rivers and estuaries, into which sea tides flow; or where floods are frequent, provided, however, that in either case the waters contain alluvial matters in a state of suspension. According to the best information that can be obtained (*Marshall*, in *R. Econ. of York*. 1788. *Day*, *West Riding Report*, p. 171.), warping was first practised on the banks of the Humber, by one Barker, a small farmer at Rawcliff, between 1730 and 1740. It was afterwards extended by Richard Jennings, of Armin, near Howden, in 1743; but it was about the year 1753 before it was attempted by any other person. It was first brought into notice by Marshall, in 1788, and subsequently in the *Report of the West Riding of Yorkshire*, and is now practised by various proprietors and farmers on the Humber, the Trent, and other rivers. It has been long practised in Italy (267.) in a somewhat different manner to what it is in this country, and may be considered as of Egyptian origin.

4118. *The theory of warping* is thus given by Arthur Young. The waters of the tides that come up the Trent, Ouse, Dun, and other rivers which empty themselves into the great estuary of the Humber, is muddy to an excess; inasmuch that in summer, if a cylindrical glass, twelve or fifteen inches long, be filled with them, it will presently deposit an inch, and sometimes more, of what is called warp. Where this warp comes from is a dispute. The Humber, at its mouth, is clear water; and no floods in the countries washed by the warp rivers bring it, but, on the contrary, do much mischief by spoiling the warp. In the very driest seasons and longest droughts, it is best and most plentiful. The improvement is perfectly simple, and consists in nothing more than letting in the tide at high water to deposit the warp, and permitting it to run off again as the tide falls; this is the aim and effect. But to render it efficacious, the water must be at command, to keep it out and let it in at pleasure; so that there must not only be a cut or canal made to join the river, but a sluice at the mouth to open or shut, as wanted; and that the water may be of a proper depth on the land to be warped, and also prevented flowing over contiguous lands, whether cultivated or not, banks are raised around the fields to be warped, and from three or four to six or seven feet high, according to circumstances. Thus, if the tract be large, the canal which takes the water, and which, as in irrigation, might be called the grand carrier, may be made several miles long: it has been tried as far as four, so as to warp the lands on each side the whole way, and lateral cuts made in any direction for the same purpose; observing, however, that the effect lessens as you recede from the river; that is, it demands longer time to deposit warp enough for producing benefit.

4119. *The effect of warping* is very different from that of irrigation; for it is not the water that works the effect, but the mud, so that in floods the business ceases, as also in winter; and it is not to manure the soil, but to create it. What the nature of the land may be intended to be warped, is not of the smallest consequence: a bog, clay, sand, peat, are alike eligible: as the warp raises it in one summer from six to sixteen inches thick; and in the hollows or low places, two, three, or four feet, so as to leave the whole piece level. Thus a soil of any depth you please is formed, which consists of mud of a vast fertility, though containing not much besides sand and gravel.

4120. *In respect to the method of executing the work*, it is described in the following manner in *The Agricultural Survey of the West Riding of Yorkshire*, by Lord Hawke.

The land to be warped must be banked round against the river. The banks are made of the earth taken on the spot from the land: they must slope six feet; that is, three feet on each side of the top or crown of the bank, for every foot perpendicular of rise: their top or crown is broader or narrower, according to the impetuosity of the tide, and the weight and quantity of water; and it extends from two feet to twelve: their height is regulated by the height to which the spring tides flow, so as to exclude or let them in at pleasure. In these banks, there are more or fewer openings, according to the size of the ground to be warped, and to the choice of the occupier; but in general they have only two sluices; one called the floodgate, to admit; the other called the clough, to let off the water gently; these are enough for ten or fifteen acres: when the spring tide begins to ebb, the floodgate is opened to admit the tide, the clough having been previously shut by the weight of the water brought up the river by the flow of the tide. As the tide ebbs down the river, the weight or pressure of water being taken from the outside of the clough next the river, the tide water that has been previously admitted by the floodgate opens the clough again, and discharges itself slowly but completely through it. The cloughs are walled on each side, and so constructed as to let the water run off, between the ebb of the tide admitted, and the flow of the next; and to this point particular attention is paid. The floodgates are placed so high as only to let in the spring tides when opened. They are placed above the level of the common tides. Willows are also occasionally planted on the front of the banks, to break the force of the tides, and defend the banks by raising the front of them with warp thus collected and accumulated: but these willows must never be planted on the banks, as they would destroy them by giving the winds power to shake them.

4121. *The season for warping* begins in the month of July, and proceeds during the summer season, and as this sort of business can only be performed at that season, every occasion of having it executed should be embraced, by having the work in perfect repair, that every tide may be made to produce its full effect. With regard to the advantage of doing this work in the summer months, it may be remarked that at these times the lands not only become the soonest dry, a circumstance which must always fully take place before the process of cultivation can be carried on, but the tides are less mixed with fresh water, in which condition they are constantly found the most effectual.

4122. In regard to *the expense of this mode of improving lands*, it must differ much in different cases, according as the circumstances of situation and distance vary; but it can seldom exceed 12*l.* or 15*l.* the acre, according to Young, and in most instances it must be greatly below such estimates. But it is remarked by Day, in *The Agricultural Survey* of the same district, that no estimate can be made without viewing the situation of the lands to be warped, and the course and distance it will be necessary to carry the warp to such lands: 1*st*, The situation of the lands must be considered; 2*d*, The quantity of land the same drains and cloughs will be sufficient to warp; 3*d*, The expense of building the cloughs, cutting the drains, embanking the lands, &c. An estimate of these expenses being made, then it will be necessary to know the number of acres such cloughs and drains will warp, before any estimate per acre can be made; therefore it will be easy to conceive that the greater quantity of land the same cloughs and drains will warp, the easier the expense will be per acre. In Day's opinion, there are great quantities of land in the country, which might be warped at so small an expense, as from 4*l.* to 8*l.* per acre, which is nothing in comparison to the advantages which arise from it. He has known land which has been raised in value by warping, from 5*l.* to upwards of 40*l.* and 50*l.* per acre; therefore it is easy to conceive that the greatest advantages arise upon the worst land, and the more porous the soil the better, as the wet filters through, and it sooner becomes fit for use. The advantages of warping are very great; as, after lands have been properly warped, they are so enriched thereby, that they will bring very large crops for several years afterwards without any manure; and when it is necessary, the lands might be warped again by opening the old drains, which would be done at a very trifling expense, and would bring crops in succession for many years, with very little or no tillage at all, if the lands were kept free from quick grass, and other weeds, which must be the case in all lands where they are properly managed; besides, the drains which are made for the purpose of warping are the best drains that can be constructed for draining the lands at the time they are not used for warping, which is another very great advantage in low lands.

4123. *The best mode of cultivating new-warped land* must depend principally on the nature of the warp and of the subsoil. In *The Code of Agriculture* it is recommended to sow it with clover, and to let it lie under that crop for two years, in order that it may be brought into a state fit for corn. It does not answer to sow land, immediately after it is warped, with wheat, even though fallowed; but after white or red clover for two years, a good crop of wheat may generally be relied on. Nor is it proper, when land is warped, to plant it with potatoes, or to sow it with flax, being at first of too cold a nature; though these crops may answer, if the land be not too strong for potatoes,

after it has been for two or three years in cultivation. In the quality of warped land, there are most essential differences, some will be very strong, and in the same field some will be very friable. The land nearest the drain is in general the lightest, owing to the quantity of sand that is deposited as soon as the water enters the field: the land farthest from the drain is in general the best. The produce of warped land varies much, but in general it may be stated as abundant. (Code, 315.)

SUBJECT. 1. *Of the Irrigation of Arable Lands and of Subterranean Irrigation.*

4124. *The irrigation of arable lands* is universal in warm countries, and even in the south of France and Italy. The land is laid into narrow beds, between which the water is introduced in furrows during the growth of the crop, and absorbed by the soil. In other cases, the crop is grown in drills and the water introduced between each row in the furrow. In this mode of irrigation no collecting drains are required, as the whole of the water laid on is absorbed by the soil. The principal expense of this operation is that of preparing the lands by throwing the surface into a proper level or levels; the main or carrier is conducted to the higher part of the field, and the rest is easy. A particular description of the practice, as carried on in Tuscany, is given by Sigismondi. (*Agr. de la Toscane*) Some account also of the practice in Spain and the East Indies, will be found in our outline of the agriculture of these countries. 723. and 908.)

4125. *Subterraneous irrigation* appears to have been first practised in Lombardy, and first treated of by Professor Thouin. (*Annales du Musée, &c.*) It consists in saturating a soil with water from below, instead of from the surface, and is effected by surrounding a piece of ground by an open drain or main, and intersecting it by covered drains communicating with this main. If the field is on a level, as in most cases where the practice is adopted in Lombardy, all that is necessary is to fill the main and keep it full till the lands have been sufficiently soaked. But if it lies on a slope, then the lower ends of the drains must be closely stopped, and the water admitted only into the main on the upper side: this main must be kept full till the land is soaked, when the mouths of the lower drains may be opened to carry off the superfluous water. The practice is applicable either to pasture or arable lands.

4126. *In Britain*, subterraneous irrigation has been applied in a very simple manner to drained bogs and morasses, and to fen lands. All that is necessary is to build a sluice in the lower part of the main drain where it quits the drained grounds, and in dry weather to shut down this sluice, so as to dam up the water and throw it back into all the minor open drains, and also the covered drains. This plan has been adopted with success, first, as we believe, by Smith, of Swintridge Muir, in Ayrshire, and subsequently by Johnston, in the case of several bog drainages executed by him in Scotland. It is also practised in Lincolnshire, where it was introduced by the advice of the late engineer Rennie, after the completion of a public drainage at Boston.

SECT. III. *Of the Artificial Means of Procuring Water for the Use of Live Stock.*

4127. *Water is supplied by nature in most parts of the British isles*, and retained with little art both at farmeries and in fields. There are exceptions, however, in different districts, and especially in chalky soils, gravels, and some upland clays. In these cases water is procured for cattle by some of the following means: By conducting a stream, from a distant source, as in a work of irrigation; by collecting rain-water from roads, ditches, or sloping surfaces, in artificial ponds, or reservoirs; by collecting it from the roofs of buildings, and preserving it in covered cisterns; by sinking a well, or a pipe, either in the field, or the farm yard; and by artificial springs.

4128. *An artificial stream* will in most cases be found too expensive an operation to be undertaken for the supply of drinking water for live stock; but this purpose may frequently be combined with that of watering lands or driving machinery. In the North Riding of Yorkshire, there is a tract extending for many miles, entirely destitute of water, except what flows along the bottoms of the deep valleys by which it is intersected, and little relief could consequently be afforded by streams thus distantly and inconveniently situated, to the inhabitants of the uplands, or their cattle. About the year 1770, a person of the name of Ford devised the means of watering this district, by means of rills brought from the springs that break out at the foot of the still loftier moorland hills, that run parallel to and to the north of this tract, in some instances at the distance of about ten miles. The springs he collected into one channel, which he carried, in a winding direction, about the intervening tract, according to its level, and along the sides of the valleys, until he gained the summit of the arid country which he wished to supply with water; and when this was accomplished, the water was easily conveyed to the places desired, and also to the ponds in all the fields, over a considerable tract of ground.

4129. *Collecting rain-water from roads, &c. in ponds, or drinking pools.* Formerly, it is probable, something of this art has been practised throughout the kingdom: most villages, and many old farmsteads, have drinking pools for stock, which appear to have been formed or assisted by art. In strong-land grazing districts, pits have evidently been dug, to catch the rain-water fortuitously collected, by furrows and ditches; or by landsprings. On the chalk hills of the southern counties, the art has been long established, and continued down to the present time; and, on the wolds or chalk hills of Yorkshire, an improved practice has been introduced by Robert Gardner of Kilham, which gained an establishment towards the end of the last century, and has spread rapidly over the adjacent heights, with great profit to the country. In every dry-land situation, it may be practised with high advantage to an estate, and is well entitled to attention.

4130. *The mode of constructing these collecting ponds* is described in *The Annals of Agriculture* (vol. vi.), and illustrated by a section (fig. 533.). The ground plan is

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circular, and generally forty or fifty feet in diameter, and the excavation is not made deeper in the centre than five feet. This excavation being cleared out, a layer of clay (*a*, *b*, *c*) sufficiently moistened, is to be carefully beaten and trod down into a compact and solid body of about the thickness of a foot. Upon this a layer of quick-lime is finely and uniformly spread over the whole, of one inch or upwards in thickness. Next is another layer of clay of about one foot in thickness (*d*), which is to be trodden and rammed down as the former; upon this are spread stones or coarse gravel (*e*) of such thickness as may prevent the pond receiving any injury from the treading of cattle, who would otherwise break through the body of the clay and lime, and by so doing let out the water; after this, the pond will remain five feet deep and forty-five feet diameter; the size they are usually made.

4131. *Brick-clay is by no means required* for the ponds; any earth sufficiently tenacious to bear beating into a solid compact body, though not approaching to a pure clay, will answer the purpose very well.

4132. *The preferable situation to make the pond* is a little valley, or at the bottom of a declivity, or near a high road, in which situation a stream of water may be brought into it after sudden showers or thaws, the object being to get it filled as soon as possible after it is made, that the sun and winds may not crack the clay; if it is not likely to be filled soon, some straw or litter must be spread over it; but in general, after it is once filled, the rains that fall in the course of the year will keep it full, no water being lost otherwise than by evaporation and the consumption of cattle.

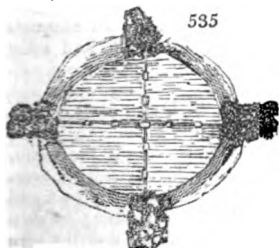
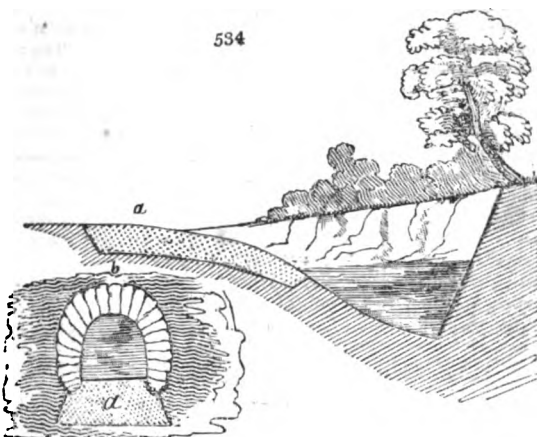
4133. *The whole excellence of the pond depends upon the lime*; care must be taken to spread it regularly and uniformly over the surface of the lower bed of clay; it is well known that ponds made of clay alone, however good its quality, and whatever care may be exerted in the execution, will frequently not hold water; these with the above precautions rarely fail. By what means the lime prevents the loss of water is not exactly known; one of these two is probably the cause; either the lime sets like terrace into a body impervious to water; or its causticity prevents the worms in dry weather from penetrating through the clay in search of the water; certain, however, it is, that with lime, thus applied, ponds may be made in sand, however porous, or on rocks however open, in neither of which situations are they to be depended upon when made with clay alone. On this mode of making ponds for the use of live stock, there are several circumstances of the process more fully detailed in *The Rural Economy of Yorkshire*.

4134. *In constructing ponds in loamy soils* all that is necessary is to coat the bottom over with clay or loam to the depth of eighteen inches or two feet, and then to puddle or work this well with water till it becomes a homogeneous layer impenetrable to that element. If clay or loamy earth cannot be obtained, any earth not very much inclined to sand may be substituted, but it will require more labor in puddling. On clayey soils very little more is necessary than smoothing the surface of the excavation, and perhaps watering it and beating it to a smooth surface with rammers. The pond being now formed, the next operation is to coat it over with coarse gravel to the depth of at least eighteen inches; or, what is preferable, chalk and flints with gravel; or, best of all, to causeway or pave it. It is also very desirable to pave or gravel the surface for the breadth of at least two yards round the pond, in order to prevent the cattle from poaching it when they come to drink.

4135. *An economical mode of forming ponds* is often adopted on clayey soils where gravel or stone for paving is scarce. It consists in adopting the horse shoe form as the ground plan of the excavation, and cutting all the sides steep, or at an angle of 45 or 50 degrees, excepting the part answering to the heel of the shoe (fig. 534 *a*), which is well gravelled or paved as the only entrance for the cattle. The excavated earth serves to raise the high side of the pond (*b*), which is generally guarded by a fence or a few trees.

The disadvantage of such ponds is, that one is required for every field, or at least for every two fields; whereas a pond sloped on all sides may supply four fields or even a greater number. (fig. 535.)

4136. *The Gloucestershire ponds* are made either of a square or a circular shape, and generally so situated, as to furnish a supply to four fields. (fig. 535.) Three layers of clay, free from the smallest stone or gravel, are so worked in, as to form an impenetrable cement. The whole is afterwards covered with sand, and finished with pavement. (*Gloucestershire Report*, p. 31.)



spread upon the pavement. (*Derbyshire Report*, vol. i. p. 494.)

4138. *The situation of field ponds*, where practicable, should be at the intersection of fences, so as one may serve as many fields as possible. This, however, cannot be the best situation in every case, because it may happen that water cannot there be collected. At the same time, a low situation is not desirable in every case, because it may be so circumstanced that too much dirty water may run into it during rains.

4139. *Trees are frequently planted round ponds*, and with seeming propriety, as their effect is beautiful, and they shade the water from the direct influence of the sun during summer; but in autumn their leaves certainly tend to render the water impure for a time. As most leaves are of an astringent quality, perhaps there may be no injury sustained by cattle from drinking such water at first; but after some time the leaves begin to decay and occasion a sort of fermentation, which, till it subsides in the beginning of frosty weather, renders the water somewhat unhealthy and very unsightly.

4140. *Wells*, where no better method of procuring water can be devised, may be resorted to, both for fields and farmeries; but the great objection to them is the labor required to pump up, or otherwise raise the water, and the consequent risk of neglect. Before proceeding to dig a well, it ought first to be determined on whether a mere reservoir for the water which oozes out of the surface soil is desired or obtainable, or a perpetual spring. If the former is the object in view, a depth of fifteen or twenty feet may probably suffice, though this cannot be expected to afford a constant supply unless a watery vein or spring is hit on: if the latter, the depth may be very various, there being instances of 300 and 500 feet having been cut through before a permanent supply of water was found. (*Middlesex, Surrey, and Hampshire Reports*.)

4141. *The art of well-digging* is generally carried on by persons who devote themselves exclusively to that department. The site being fixed on, the ground-plan is a circle, generally of not more than six or eight feet in diameter: the digger then works down by means of a small short-handled spade, and a small implement of the pick-axe kind; the earthy materials being drawn up in buckets by the hand or a windlass, fixed over the opening for the purpose. Where persons conversant with this sort of business are employed, they usually manage the whole of the work, bricking round the sides with great facility and readiness; but in other cases, it will be necessary to have a bricklayer to execute this part of the business.

4142. *Steining.* There are two methods of building the stone or brick within the well, which is called the steining. In one of these a circular ring is formed, of the same diameter as the intended well; and the timber of which it is composed is of the size of the brick-courses, with which the well is to be lined. The lower edge of this circle is made sharp, and shod with iron, so that it has a tendency to cut into the ground; this circular kirk is placed flat upon the ground, and the bricks are built upon it to a considerable height, like a circular wall. The well-digger gets within this circle, and digs away the earth at the bottom; the weight of the wall then forces the kirk, and the brick-work with which it is loaded, to descend in the earth, and as fast as the earth is removed it sinks deeper, and the circular brick-wall is increased or raised at top as fast as it sinks down; but when it gets very deep, it will sink no longer, particularly if it passes through soft strata: in this case, a second kirk of a smaller size is sometimes began within the first. When a kirk will not sink from the softness of the strata, or when it is required to stop out water, the bricks or stones must be laid one by one at the bottom of the work, taking care that the work is not left unsupported in such a manner as to let the bricks fall as they are laid: this is called under-pinning.

4143. *Noxious air.* Well-diggers experience sometimes great difficulty from a *noxious air* which fills the well, and suffocates them if they breathe it. The usual mode of clearing wells of noxious air is, by means of a large pair of bellows, and a long leathern pipe, which is hung down into the well to the bottom, and fresh air is forced down to the bottom by working the bellows.

4144. *The use of the auger* is common in well-digging, both in ascertaining before commencement the nature of the strata to be dug into, and also in course of digging for the same purpose; and because, by boring in the bottom of a well to a considerable depth, the spring is sometimes hit upon, and digging rendered no longer necessary.

4145. In particular situations, *the use of the borer alone* may procure an adequate supply of water. This mode appears to have been long resorted to in this and other countries. From what we have already stated as to the disposition of strata, the conditions requisite for its success will be readily conceived; viz. watery strata connected with others on a higher level: the pressure of the water contained in the higher parts of such strata on the lower will readily force up the latter through any orifice, however small. All that is necessary, therefore, is to bore down to the stratum containing the water, and having completed the bore, to insert a pipe, which may either be left to overflow into a cistern, or it may terminate in a pump. In many cases, water may be found in this way, and yet not in sufficient quantity and force to rise to the surface; in such cases a well may be sunk to a certain depth, and the auger-hole made, and the pipe inserted in it in the bottom of the well. From the bottom it may be pumped up to the surface by any of the usual modes.

4146. *As an example of well-digging combined with boring*, we give that of a well dug at a brewery at Chelsea, Middlesex, in 1793. The situation was within 20 or 30 feet of the edge of the Thames, and the depth 394 feet, mostly through a blue clay or marl. At the depth of near fifty feet a quantity of loose coal, twelve inches in thickness, was discovered: and a little sand and gravel was found about the same depth. The well-digger usually bored about ten, fifteen, or twenty feet at a time lower than his work as he went on, and on the last boring, when the rod was about fifteen feet below the bottom of the well, the man felt, as the first signal of water, a rolling motion, something like the gentle motion of a coach passing over pavement; upon his continuing to bore, the water presently pushed its way by the side of the auger with great force, scarcely allowing him time to withdraw the borer, put that and his other tools into the bucket and be drawn up to the top of the well. The water soon rose to the height of two hundred feet.

4147. In a case which occurred in digging a well at *Dr. Darwin's*, near Derby, the water rose so much higher than the surface of the ground, that by confining it in a tube, he raised it to the upper part of the house. (*Rees's Cyclopædia*, art. *Well*, and *Derbyshire Rep.*)

4148. *The process of boring the earth for spring water* has of late been practised, with great success, in various parts of England, chiefly by a person named Good, of Huntingdon. In the neighborhood of London, many fountains of pure spring-water have lately been obtained by these means. We may particularly name those at Tottenham, Middlesex, and Mitcham, Surrey, both of which afford a continuous and abundant flow of water, equal to about eight gallons per minute. A very copious fountain, which rises twenty feet above the surface, has lately been obtained by the same means in the grounds of Ravenscroft Park, the seat of G. Scott, Esq., near Hammersmith. Indeed there can be little doubt that in the great majority of situations, not only in Britain, but throughout the world, water might be found by boring or digging down a few scores of feet.

4149. *The boring is effected by means of an auger*, similar to the instrument employed in boring for coal. The auger is connected to an iron rod, about four or five feet long, which is introduced into the ground in a perpendicular direction, a slight power being exerted on the top: it is turned by manual labor. When the auger has descended as far as the length of the rod will permit by cutting its way through the ground, it is then drawn up by a shaft and windlass; and the earth which occupied the space thus bored, is brought up with it and discharged from the auger. Another length of rod is added to the auger as it gets deeper,

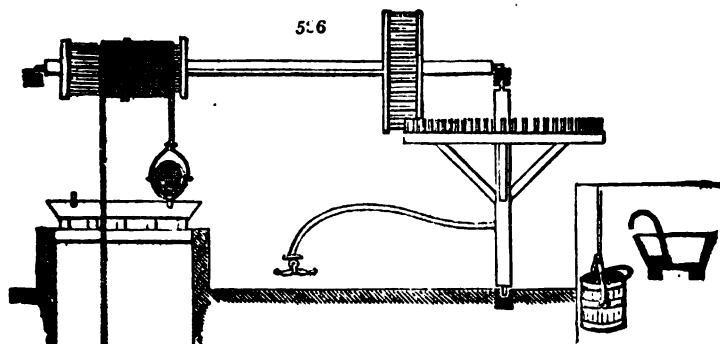
by means of coupling boxes, and a cast-iron tube is introduced into the hole, and driven down. The length of this tube is about sixteen feet with an orifice of about four and a half inches, and an upper flange on the top of which the superstructure of the fountain is to be raised, whether plain or ornamental: the use of this tube is to exclude the land springs, and assist in keeping the further progress of the borer perpendicular. — Additional rods being now coupled to the auger, the boring proceeds until the spring discovers itself, which, in general, has been found at the commencement of a stratum of sand, about one hundred feet below the surface. Tin pipes are now introduced into the bore, of about three inches diameter, and twenty feet long. When the first length of pipe has been forced nearly down, another similar pipe is soldered on to the top of it: the pipe is then driven further down, and a third length soldered to the top of the last, and so on until the whole bore is encased by one continued pipe, from top to bottom, by which the earth is prevented from falling in, and the passage of the water kept perfectly clear.

4150. *As various obstructions must occasionally intercept the progress of the auger*, different kinds of instruments are employed for removing them, of particular construction and action. When rocky strata are to be penetrated, a kind of weighted pecker is let down, by which the column of the rock is broken, or pounded into small pieces, the fragments of which are collected, and brought up by a sort of box auger.

4151. *This operation has not yet failed of procuring water in any one instance*, though, by the spring flowing to the level of its source, the water does not always flow up above the ground, and indeed sometimes does not reach the surface; but, under these circumstances, by sinking a well a short distance, the water will flow plentifully. According to the altitude of the head, or source, of the spring, will be its force in rising. If the bore be made in a valley, and the source of the spring should be in the interior of a neighboring hill, the stream would flow through the meandering fissures of the earth and rise to its level, wherever a vent is given; and under these circumstances, would flow above the surface of the outlet, by a pressure equal to the weight of a column of water between its level and the altitude of the source. If the source be upon the same level as the outlet (whatever their distance apart), the water will flow to the surface only, without running over. But, if the source should be below the level of the outlet, then it will be necessary to sink a well down to that level and a little lower, before a free supply of water will be furnished.

4152. *The expense of this process appears to be very trivial*; the charges being four-pence per foot for sinking the first ten feet; eight-pence per foot for the second ten feet; twelve-pence for the third; and so on; increasing four-pence per foot at every additional ten feet of descent; this charge being for labor, exclusive of the cost of tubes: whereas, the expense of ordinary well-sinking amounts to about eight times that sum. The advantages of flowing springs of good water, which, by these means, may always be obtained on the sides of roads, and in a variety of other places where water is not at present found, are incalculable; the cost very small, and the operation easy and expeditious. Within one week, the operation of boring for the spring at Tottenham, was begun and finished, a depth of one hundred and five feet.

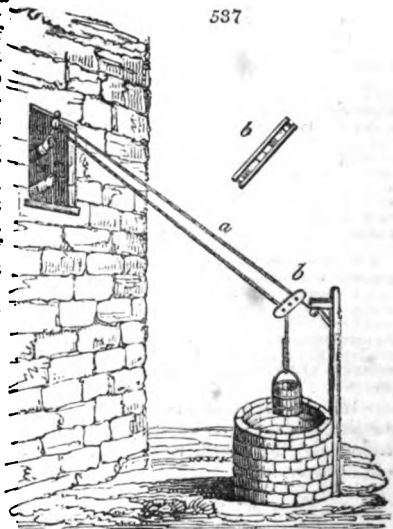
4153. *Of the various modes of raising water from deep wells*, the pump is most convenient, and the lever and bucket the most simple. When a constant supply is wanted from a very deep well, machinery (fig. 536.) may be erected over it, and driven by an old horse or ass.



4154. *Pumps are of various kinds*, as the lifting pump; the forcing pump, for very deep wells; the suction pump; and the roller pump, a recent invention for such as do not exceed thirty-three feet in depth. A good pump for urine pits or reservoirs, where the water is not to be raised above twenty-eight or thirty feet in depth, is that of Robertson Buchanan, author of *A Treatise on Heating by Steam*, &c., because this pump, which acts by the pressure of the atmosphere, will raise drainings of dunghills, or even water thickened by mud, sand, or gravel. "The points in which it differs from the common pump, and by which it excels, are, that it discharges the water below the piston, and has its valves lying near each other. The advantages of this arrangement are — that the sand or other matter, which may be in the water, is discharged without injuring the barrel or the piston-leathers; so that besides avoiding unnecessary tear and wear, the power of the pump is preserved, and it is not apt to be diminished or destroyed in moments of danger, as is often the case with the common and chain pumps; that the valves are not confined to any particular dimensions, but may be made capable of discharging every thing that can rise in the suction-piece without danger of being choked; and that if, upon any occasion, there should happen to be an obstruction in the valves, they are both within the reach of a person's hand, and may be cleared at once, without the disjunction of any part of the pump. It is a simple and durable pump, and may be made either of metal or wood, at a moderate expense." Where clear water only is to be raised,

Aust's (of Hoxton) *curvilinear* pump is preferable to the common sort. The advantages depend on the curvilinear form of the barrel, which allows, and indeed obliges, the rod, the handle, and the lever, on which it works, to be all in one piece. Hence simplicity, cheapness, precision of action, more water discharged in proportion to the diameter of the barrel, and less frequent repairs. (*Repertory of Arts*, Jan. 1821.) Perkins's square-barrelled pump is a powerful engine (*London Journal*, &c.); but this and other contrivances for raising water, though of great merit, cannot often be made available by the improver from their not having come into general use.

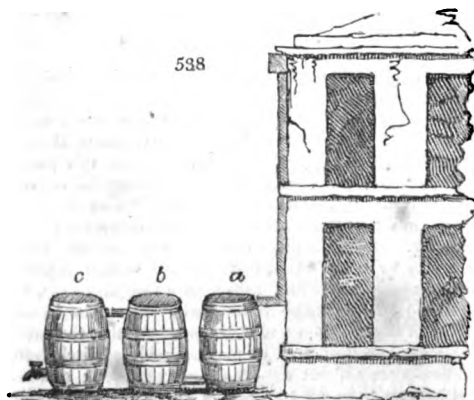
4155. *An old but ingenious mode of raising water from a well to the upper part of a house* (fig. 537.), is sometimes adopted on the continent. A post is fixed close to the well; this is connected with the opening in the upper part of the house, where the water is to be introduced, by a fixed cord (a). On this cord a wooden collar (b) is placed, and slides freely from one end to the other: the bucket rope is put through a hole in the collar, and over a pulley in the window in the upper part of the house, and thus the bucket is first raised perpendicularly from the water in the well till it comes in contact with the collar, when the power being continued, the collar slides along the fixed rope till it reaches the operator at the window. (*Last. Col. de Machines*, &c.)



4156. *Artificial springs.* Marshal, seeing the formation of natural springs, and observing the effect of subsoil drains, and being, at the same time, aware of an objection to roof water, which, though more wholesome, is seldom so well tasted as spring water; was led to the idea of forming artificial land-springs, to supply farmsteads with water, in dry situations. He proposes arresting the rain-water that has filtered through the soil of a grass ground, situated on the upper side of the buildings, in covered drains, clayed and dished at the bottom, and partially filled with pebbles or other open materials: thus conveying it into a well or cistern, in the manner of roof water: and by this means uniting, it is probable, the palatableness of spring water with the wholesomeness of that which is collected immediately from the atmosphere.

4157. *Water for common farm-yard and domestic purposes* may be obtained in most situations, by collecting that which falls on the roofs of the farmery and dwelling-house. This is done by a system of gutters and pipes, which, for the farmery, may lead to a cistern or tank under ground; and for the family, that from the roof of the dwelling-

house may be conducted to a tub. Before using it, it may be filtered in various ways: one is, to have three tubs all of the same size (fig. 538.), the first (a) nearly filled with gravel or very coarse sand; the second (b), with powdered charcoal, with a stratum of sponge covering it, and the third (c) empty. The water falls from the gutter or spout into the top of the gravel barrel, and filtering through it, ascends through the charcoal and sponge in the next, and passes over clear and sweet into the receiving barrel (c); from which it is drawn as wanted. Where one receiving barrel is not enough, two or



more may be added, or the water may be led from it to an underground cistern or cellar.

4158. *Filling water on a large scale* may be effected by emptying one pond into another, through a conduit of any kind filled with gravel, sand, and charcoal.

CHAP. IV.

Of the Improvement of Lands lying Waste, so as to fit them for Farm-Culture.

4159. *Of waste lands*, many descriptions are best improved by planting, and therefore are to be considered as disposed of in that way in the laying out or arrangement of an estate; but there are others which may be more profitably occupied as farm-lands, and it is the preparing or bringing these into a state of culture, which is the business of the present chapter. Such lands may be classed as mountainous or hilly grounds, rocky or stoney surfaces, moors, bogs or peat-mosses, marshes, woody wastes or wealds, warrens or downs, and sea-shores or beaches. In the improvement of these subjects, many of the operations are such as are performed by temporary occupiers or farmers; but as in this case such occupiers have always extraordinary encouragement from the landlords, either in the shape of a low rent, of money advanced, of long leases, or of all of these; we consider it preferable to treat of them as permanent, or fundamental improvements, than to consider them as parts of farm-culture.

SECT. I. *Of mountainous and hilly Grounds and their Improvement.*

4160. *The upper parts of mountains* may be considered as among the least improvable parts of the earth's surface, from the impossibility of ever improving their climate. "The highest peaks and ridges are mostly naked granite, slate, or volcanic productions. Their more elevated sides, and the tops of those of moderate height, are usually covered by a thin soil, producing a short dry herbage, which is frequently mixed with a dwarf, or stunted heath. Where the soil is not injured by moisture, these are best calculated for sheep. When the height of mountains exceeds 800 feet of elevation above the level of the sea, unless covered either with natural woods or artificial plantations, they can only be profitably used in pasture." (Code.)

4161. *The hills, or land less elevated than mountains*, have, in general, a deeper and moister soil, and produce a more luxuriant herbage, but of a coarse quality; hence they are better adapted for small hardy cattle. Though the summits of hills are generally unfit for raising grain, yet the plough is gradually ascending along their sloping sides, and within the last thirty years many thousand acres in such situations have been reclaimed in the united kingdom.

4162. *Sleep lands along the sides of rivers* and small streams are often inaccessible to the plough, and unfit for tillage. The more rugged of these are well calculated for woods or coppice; while those in more favorable situations and climates may be converted into orchards. (Code of Agr. 161.)

SECT. II. *Of rocky or stoney Surfaces.*

4163. *Rocky and stoney lands* are common in the valleys of a hilly or mountainous country, and sometimes, as in Aberdeenshire, they cover immense tracts of flat surface.

4164. *When rocks protrude from the surface* here and there in fragments of a few tons, and it is considered desirable to render the field or scene fit for aration, the only mode is to rend them asunder by gunpowder, and then carry off the fragments for walls, drains, roads, or buildings; or, if they are not wanted for these or any other purpose, to bury them so deep in the ground as to be out of the reach of the plough. But where rocks rise in considerable masses of several poles in diameter, it will generally be found preferable to enclose and plant them. Clefts and crevices are found in all rocks which have been long exposed to the air and weather, and in these may be inserted young plants, or seeds, or both. Such masses being enclosed by rough stone walls, formed from the more detached fragments, or from loose stones, will grow up and be at once highly ornamental and useful as shelter. It is true they will interrupt the progress of the plough in a straight line, but not more so than the rock if left in a state of nature. When a rocky surface is not intended to be ploughed, all that is necessary is to remove as many of the solitary rocks as possible, and either enclose and plant the rest, or cover them with earth.

4165. *The stones which impede the improvement of land* are either loose, thrown up when the land is trenched, or ploughed; or fixed in the earth, and not to be removed without much labor and expense.

4166. *Loose stones* may often be converted into use for the purpose of covered drains, of constructing walls or fences, or making and repairing the roads on the farm, or in the

neighborhood; and on these accounts are sometimes worth the trouble of collecting. They may be removed, with the least inconvenience, when the land is fallowed. Where loose stones are of a moderate size, they are sometimes found advantageous rather than detrimental, as in the stone-brash soils of Somersetshire and other districts. They prevent evaporation, and thus preserve moisture in the soil. Hence the old remark, that farmers have been induced to bring back again to their corn-fields those very stones they have been induced to carry off. (*Code*.)

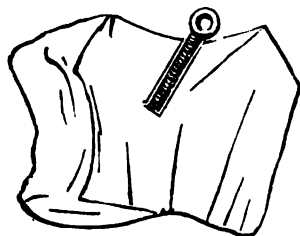
4167. *Where stones are large and fixed in the earth, if they appear above the surface, they should be removed before the ploughing of the waste commences: but where they are concealed under the surface, various modes to get rid of them have been adopted. In some parts of Yorkshire, the whole surface is gone over with sharp prongs, which, at the distance of every twelve or fourteen inches, are thrust into the ground to the depth of about a foot, to ascertain where stones are to be met with. The spot is marked by a twig, and the stones are removed before the land is ploughed. Sometimes the plough is used without such previous examination, and the place marked where stones are encountered, that they may be taken away; and sometimes, in order to discover and remove such stones, the land is trenched by the spade. (Communications to the Board of Agr. vol. ii. p. 253.)*

4168. *Stones above the surface may be avoided by the ploughman, though not without loss of ground; but stones under the surface are often not discovered till the plough is drawn against them, and perhaps broken, by which a day's work is sometimes lost. A wooden bolt, however, to unite the horse-trees to the chain of the plough, may prevent mischief by giving way. Clearing the ground from stones not only prevents such mischiefs, but is attended with actual profit. When removed, they may be used for various purposes, and are often less expensive than if dug, or purchased at a quarry. The soil round a large stone is likewise, in general, the best in the field, and is bought at a low rate by the expense of taking out the stone, as the plough has thus access to all the land around it. In stoney land the plough must proceed slowly, and cannot perform half so much work as it ought to do; but, after such impediments have been removed, the field may be ploughed with the usual facility and cheapness, and in a much more perfect manner. It frequently happens, that when working stoney land, more expense is incurred in one season by the breaking of ploughs, besides the injury done to the horses and harness, than would cure the evil. (Gen. Rep. of Scot. vol. ii. p. 256; Kaim's's Gent. Farmer, p. 58.)*

4169. *There are various modes of getting rid of stones. They are generally of such a size as admit of their being conveyed away in 539 carts, or other vehicles calculated for that purpose. Some ingenious artificers have constructed machines for raising them, when of a large size. On some occasions, pits have been dug close to large stones, and the latter have been turned into the former, at such a depth as to lie out of the reach of the plough. But it is frequently necessary to reduce their size by the force of gunpowder before they can be removed. Loose stones are commonly moved by levers, and rolled on a sledge; but sometimes they are raised by a block and tackle attached to a triangle with a pair of callipers to hold the stone (fig. 539.). The stone may also be raised by boring a hole in it obliquely and then inserting an iron bolt with an eye (fig. 540.), which though loose will yet serve to raise the stone in a perpendicular direction.*



540



4170. *The mode of bursting or rending rocks or stones by gunpowder, is a simple, though dangerous operation. When a perforation or hole is to be made in a rock or stone for the purpose of blasting with gunpowder, the prudent workman considers the nature of the rock, and the inclination or dip of the strata, if it is not a detached fragment, and from these determines the calibre, and the depth and direction of the bore or recipient for the gunpowder. According to circumstances, the diameter of the hole varies from half an inch to two inches and a half, the depth from a few inches to many feet, and the direction*

varies to all the angles from the perpendicular to the horizontal. The implements for the performance of this operation are rude, and so extremely simple and familiar, as hardly to require description; and the whole operation of boring and blasting rocks is so easily performed, that, in the space of a few weeks, an intelligent laborer may become an expert quarrier.

4171. *The operation of ramming frequently gives rise to accidents, but a recent improvement, that of using a wadding of loose sand, or of any earthy matter in a dry state,*

answers all the purposes of the firmest ramming or wadding. It has been used for upwards of ten years at Lord Elgin's extensive mining operations at Charlestown in Fifeshire, and also in removing immense bodies of rock from the Calton hill at Edinburgh, by Stevenson, an eminent engineer, whose article on the subject of blasting, in *The Supplement to the Encyc. Brit.*, deserves the attention of such as use the process in working quarries or clearing rocky or stoney grounds.

SECT. III. *Of improving Woody Wastes or Wealds.*

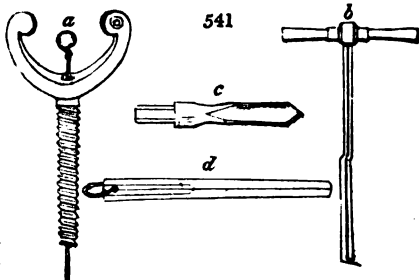
4172. *With surfaces partially covered with bushes and stumps of trees, ferns, &c., the obvious improvement is to grub them up, and apply the land to cultivation according to its nature.*

4173. *The growth of large trees is a sign that the soil is naturally fertile. It must also have been enriched by the quantity of leaves which in the course of ages have fallen and rotted upon the surface. Such are the beneficial effects of this process, that after the trees have been cut down, the soil has often been kept under crops of grain for a number of years without interruption, or any addition of manure. Land thus treated, however, ultimately becomes so much reduced, by great exhaustion, that it will not bear a crop worth the expense of seed and labor. (Communications to the Board of Agriculture, vol. ii. p. 257.) It is evident, however, that this deterioration entirely proceeds from the improvident management previously adopted. In reclaiming such wastes, the branches of trees that are felled are generally collected and burnt; and the ashes are either in whole or in part, spread on the ground, by which the fertility of the soil is excited. Indeed, where there is no demand for timber on the spot, nor the means of conveyance to any advantageous market, the whole wood is burnt, and the ashes applied as manure.*

4174. *Much coppice land has been grubbed up in various parts of England, and brought into tillage. Sometimes woods are grubbed for pasture merely. In that case the ground should be as little broken as possible, because the surface of the land, owing to the dead wood and leaves rotting time out of mind upon it, is much better than the mould below. It soon gets into good pasture as grass land, without sowing any seed. (Communications to the Board of Agriculture, vol. iv. p. 42.) But by far the most eligible mode of converting wood land into arable, is merely to cut down the trees, and to leave the land in a state of grass until the roots have decayed, cutting down with the scythe from time to time any young shoots that may arise. The roots in this way, instead of being a cause of anxiety and expense, as they generally are, become a source of improvement; and a grassy surface is prepared for the operation of sod-burning. (Marshal's Yorkshire, vol. i. p. 316.)*

4175. *Natural woods and plantations have been successfully grubbed up in Scotland. In the lower Torwood in Stirlingshire, many acres of natural coppice were cleared; and the land is now become as valuable as any in the neighborhood. (Stirlingshire Report, p. 213.) On the banks of the Clyde and the Avon, coppices have been cut down, and after being drained, cultivated, and manured, the land has been converted into productive orchards. In Perthshire also, several thousand acres of plantations have been rooted out, the soil subjected to the plough, converted into good arable land, and profitably employed in tillage. (Perthshire Report, p. 329.)*

4176. *For pulling up or rending asunder the roots of large trees, various machines and contrivances have been invented. Clearing away the earth and splitting with wedges is the usual mode; but blasting is also, as in the case of rocks and stones, occasionally resorted to. For this purpose a new instrument, called the *blasting-screw* (fig. 541.) has been lately applied with considerable success to the rending or splitting of large trees and logs of timber. It consists of a screw (a), an auger (b, c), and charging-piece (d). The screw is wrought into an auger-hole, bored in the centre of the timber; here the charge of powder is inserted, and the orifice of the hole in the log is then shut up or closed with the screw, when a match or piece of cord, prepared with saltpetre, is introduced into a small hole (a), left in the screw for this purpose, by which the powder is ignited. The application of this screw to the purposes of blasting is not very obviously necessary, because, from what we have seen (4171.) it would appear that the auger-hole being charged with powder and sand, would answer every purpose. One great objection to the process of blasting applied to the rending of timber is, the irregular and uncertain direction of the fracture, by which great waste is sometimes occasioned. It may, however, be necessary*



to resort to this mode of breaking up large trees, when cut down and left in inaccessible situations, where a great force of men and of implements cannot easily be procured or applied; and certainly it is one of the most effectual modes of tearing their stools or roots in pieces. (*Sup. Encyc. Brit. art. Blasting.*)

4177. *Land covered with furze, broom, and other shrubs*, is generally well adapted for cultivation. The furze, or whin (*Ulex europæus*), will grow in a dense clay soil; and where they are found in a thriving state, every species of grain, of roots and grasses, may be cultivated with advantage. The broom, on the other hand, prefers a dry, gravelly, or sandy soil, such as is adapted for the culture of turnips. A large proportion of the arable land, in the richest districts of England and Scotland, was originally covered by these two plants; and vast tracts still remain in that state, which might be profitably brought under cultivation. For that purpose, the shrubs ought to be cut down, the ground trenched, or the plants rooted out by a strong plough, drawn by four or six horses, and the roots and shrubs (if not wanted for other purposes) burnt in heaps, and the ashes spread equally over the surface. (*Com. to the B. of Ag. vol. ii. p. 260.*) In many places, shrubs and brushwood may be sold for more than the expense of rooting them out. When coal is not abundant, and limestone or chalk can be had, the furze should be employed in burning the lime that is used in carrying on the improvement. (*Oxfordshire Report, p. 232.*) It requires constant attention, however, to prevent such plants from again getting possession of the ground, when it is restored to pasture. This can best be effected, by ploughing up the land occasionally, taking a few crops of potatoes, turnips, or tares in rows, and restoring it to be pastured by sheep. In moist weather also, the young plants should be pulled up and destroyed. (*Code.*)

4178. *Fern (Pteris and Osmunda)* is a very troublesome weed to extirpate, as, in many soils, it sends down its roots into the under stratum, beyond the reach of the deepest ploughing; but it is a sign of the goodness of any soil, where it grows to a large size. June or July are the best seasons for destroying it, when the plants are full of sap, and when they ought to be frequently cut. They are not, however, easily subdued, often appearing after a rotation of seven years, including a fallow, and sometimes requiring another rotation, and cutting them repeatedly, before their final disappearance can be effected. Lime, in its caustic state, is peculiarly hostile to fern; at the same time, it can hardly be completely eradicated, but by frequent cultivation, and by green crops assisted by the hoe. (*Oxfordshire Report, p. 234. and 240.*)

4179. *The heath (Erica)* is a hardy plant, palatable and nutritious to sheep; and under its protection, coarse grasses are often produced. When young, or in flower, it may be cut and converted into an inferior species of winter provision for stock. But where it can be obtained, it is desirable to have grass in its stead. For that purpose, the land may be flooded, or the heath burnt in March or April, and kept free from stock for eighteen months; in consequence of which, many new grasses will spring up, from the destruction of the heath, and the enriching quality of the ashes. The improvement is very great; more especially if the land be drained, and lime or compost be applied. (*Gen. Rep. of Scot. vol. ii. p. 359.*) But if the land be too soon pastured, the grasses, being weak and tender, the sheep or cattle will pull them up with their roots, and the pasture is materially injured. (*Statistical Account of Scotland, vol. iv. p. 465.*) Where it is proposed to cultivate the land for arable crops, the lime applied should be in a finely powdered state, highly caustic, and as equally spread as possible. (*Com. to the B. of Ag. vol. ii. p. 264.*)

4180. *Paring and burning* is a speedy and effectual mode of bringing a surface covered with coarse herbage into a state of culture. Some have recommended making a compost of the pared surface, with lime; or building folds or earthen walls of the sods, which, by the action of the atmosphere, become friable and fertile; but these processes are slower and not so effectual as paring and burning. In coarse rough pastures, ant-hills frequently abound, which paring and burning effectually destroys. (*Code.*)

SECT. IV. Of Moors and their Improvements.

4181. *Moorlands* are of various descriptions. Sometimes they are in low and mild situations, where the upper soil is thin, or scantily supplied with vegetable mould; and where the bottom or under-stratum is impervious and barren. These, in general, may be reclaimed with more or less advantage, according as they are near manure or markets, and other means of improvement. Others, on the contrary, are in situations much elevated above the level of the sea; where the surface is covered with heath and other coarse plants, and frequently encumbered with stones. Such moors are seldom worth the expense of cultivation, and from their height are only calculated for woods or pasturage.

4182. *Moors which are not placed in high or bleak situations*, where the surface is close-swarded, or covered with plants, and where the subsoil is naturally either not altogether wet, or capable of being made sufficiently dry at a moderate expense, may not only be reclaimed, but often can be highly improved by the common operations of farm culture;

by paring and burning; by fallow and liming; or by trenching or deep ploughing. Vast improvements on different sorts of moory lands have been made in Yorkshire, where there are immense tracts of moors. It is stated in *The Agricultural Report of the North Riding of Yorkshire*, that an improvement was made upon Lockton moor, on a quantity of land of about seventy acres, which would not let for more than 1s. per acre, before it was enclosed. Of this forty-eight acres were pared and burnt, and sown with rape, except about an acre sown with rye; the produce about sixty quarters. The rye grew very strong, and in height not less than six feet, and was sold, while standing, for five guineas the acre. The land was only once ploughed, otherwise the crop of rape would probably have been much better. One hundred and twenty chaldrons (each thirty-two bushels) of lime were ploughed into the field; which, for want of more frequent ploughing, probably was not of the service it otherwise might have been. Part of the land was afterwards sown down with oats and grass seeds; the former of which afforded but a moderate crop, the latter a very good one, and has since produced two loads, 120 stones each, per acre. The seeds sown were rye-grass, rib-grass, white clover, and trefoil; of these, the first succeeded amazingly, the others not so well; potatoes throve very well; turnips not equal to them. A farm-house has been built upon it, which now, along with five acres more of the same kind of land, is let on lease at thirty pounds per annum. The soil consisted, in general, of benty peat, upon red gritstone, with a mixture of clay upon limestone; this last is, in some places, at a considerable depth, in others, sufficiently near the surface for lime to be burnt on the premises.

Sect. V. Of Peat Mosses, Bogs, and Morasses, and their Improvement.

4183. *Mossy and boggy surfaces* occupy a very considerable portion of the British isles. In Ireland alone there are of flat red bog, capable of being converted to the general purposes of agriculture, 1,576,000 acres; and of peat soil, covering mountains, capable of being improved for pasture, or beneficially applied to the purposes of plantation, 1,255,000 acres, making together nearly three millions of acres. Mossy lands, whether on mountains or plains, are of two kinds; the one black and solid, the other spongy, containing a great quantity of water, with a proportion of fibrous materials.

4184. *Black mosses*, though formerly considered irreclaimable, are now found capable of great melioration. By cultivation, they may be completely changed in their quality and appearance; and from a peaty, become a soft vegetable earth of great fertility. They may be converted into pasture; or, after being thoroughly drained, thriving plantations may be raised upon them; or, under judicious management, they will produce crops of grain and roots; or, they may be formed into meadow-land of considerable value.

4185. *Flow, fluid, or spongy mosses*, abound in various parts of the British isles. Such mosses are sometimes from ten to twenty feet deep, and even more, but the average may be stated at from four to eight. In high situations, their improvement is attended with so much expense, and the returns are so scanty, that it is advisable to leave them in their original state; but where advantageously situated, it is now proved that they may be profitably converted into arable land, or valuable meadow. If they are not too high above the level of the sea, arable crops may be successfully cultivated. Potatoes, and other green crops, where manure can be obtained, may likewise be raised on them with advantage.

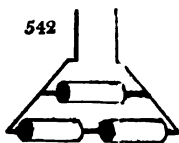
4186. *Peat* is certainly a production, capable of administering to the support of many valuable kinds of plants. But to effect this purpose, it must be reduced to such a state, either by the application of fire, or the influence of putrefaction, as may prepare it for their nourishment. In either of these ways, peat may be changed into a soil fit for the production of grass, of herbs, or of roots. The application of a proper quantity of lime, chalk, or marl, prepares it equally well for the production of corn. (*Code*.)

4187. *The fundamental improvement* of all peat soils is drainage, which alone will in a few years change a boggy to a grassy surface. After being drained, the surface may be covered with earthy materials, pared and burned, fallowed, dug, trenched, or rolled. The celebrated Duke of Bridgewater covered a part of Chatmoss, with the refuse of coal-pits, a mixture of earths and stones of different qualities and sizes, which were brought in barges out of the interior of a mountain; and, by compressing the surface, enabled it to bear pasturing stock. Its fertility was promoted by the vegetable mould of the morass, which presently rose and mixed with the heavier materials which were spread upon it. (*Marshal on Landed Property*, p. 46.)

4188. *The fenny grounds* of Huntingdonshire are in some cases improved by applying marl to the surface. Where that substance is mixed with the fen soil, the finer grasses flourish beyond what they do on the fen soil unmixed; and when the mixed soil is ploughed, and sown with any sort of grain, the calcareous earth renders the crops less apt to fall down, the produce is greater, and the grain of better quality than on any other part of the land. (*Huntingdonshire Report*, p. 301.)

4189. *Covering the surface of peat bogs with earth* has been practised in several parts of Scotland. Clay, sand, gravel, shells, and sea ooze, two or three inches thick, or more, have been used, and land, originally of no value, has thus been rendered worth from 2*l.* to 3*l.* and even 4*l.* per acre. The horses upon this land, must either be equipped with wooden clogs, or the work performed in frosty weather, when the surface of the moss is hard. Coarse obdurate clay (provincially *till*), is peculiarly calculated for this process, as, when it is blended with peat, and some calcareous matter, it contains all the properties of a fertile soil. (*Clydesdale Report*, p. 150, note.) This is certainly an expensive method of improving land, unless the substance to be laid upon it, is within 500 yards distance: but where it can properly be done, the moss thus obtains solidity, and after it has been supplied with calcareous earth, it may be cultivated, like other soils, in a rotation of white and green crops. In the neighborhood of populous towns, where the rent of land is high, the covering substance may be conveyed from a greater distance than 500 yards. (*Code*.)

4190. *Rolling peaty surfaces* has been found to improve them. The greatest defect of soft soils is, that the drought easily penetrates them, and they become too open. The roller is an antidote to that evil, and the expense is the only thing that ought to set bounds to the practice of this operation. It also tends to destroy those worms, grubs, and insects, with which light and fenny land is apt to be infested. The roller for such soils ought not to be heavy, nor of a narrow diameter. If it be weighty, and the diameter small, it sinks too much where the pressure falls, which causes the soft moss to rise before and behind the roller, and thus, instead of consolidating, it rends the soil. A gentle pressure consolidates moss, but too much weight has a contrary effect. A roller for moss ought therefore to be formed of wood, the cylinder about four feet diameter, and mounted to be drawn by two or three men. Three small rollers working in one frame, (*fig. 542.*), have sometimes been so drawn. If horses are employed, they ought to have clogs or pattens, if likely to sink. The oftener the rolling is performed, on spongy soils as long as the crops of corn or grass will admit of it, the better, and the more certain is the result.



4191. *An extensive tract of moss in the county of Lancashire* has been recently improved by the celebrated Roscoe of Liverpool, in a very spirited and skillful manner. Chatmoss in that county is well known; its length is about six miles, its greatest breadth about three miles, and its depth may be estimated from ten to upwards of thirty feet. It is entirely composed of the substance well known by the name of peat, being an aggregate of vegetable matter, disorganized and inert, but preserved by certain causes from putrefaction. On the surface it is light and fibrous, but becomes more dense below. On cutting to a considerable depth, it is found to be black, compact, and heavy, and in many respects resembling coal. There is not throughout the whole moss the least intermixture of sand, gravel, or other material, the entire substance being a pure vegetable. About 1820, Roscoe began to improve Trafford moss, a tract of three hundred acres, lying two miles east of Chatmoss; and his operations on it seem to have been so successful as to encourage him to proceed with Chatmoss. In the improvement of the latter, he found it unnecessary to incur so heavy an expense for drainage as he had done in the former. From observing that where the moss had been dug for peat, the water had drawn towards it from a distance of fifty to a hundred yards, he conceived that if each drain had to draw the water only twenty-five yards, they would, within a reasonable time, undoubtedly answer the purpose. The whole of the moss was therefore laid out on the following plan.

4192. *A main road*, Roscoe states, "was first carried nearly from east to west, through the whole extent of my portion of the moss. This road is about three miles long and thirty-six feet wide. It is bounded on each side by a main drain, seven feet wide and six feet deep, from which the water is conveyed, by a considerable fall, to the river. From these two main drains, other drains diverge, at fifty yards distance from each other, and extend from each side of the road to the utmost limits of the moss. Thus, each field contains fifty yards in front to the road, and is of an indefinite length, according as the boundary of the moss varies. These field-drains are four feet wide at the top, one foot at the bottom, and four feet and a half deep. They are kept carefully open, and, as far as my experience hitherto goes, I believe they will sufficiently drain the moss, without having recourse to underdraining, which I have never made use of at Chatmoss, except in a very few instances, when, from the lowness of the surface, the water could not readily be gotten off without open channels, which might obstruct the plough."

4193. *The cultivation of the moss* then proceeds in the following manner:—"After setting fire to the heath and herbage on the moss, and burning it down as far as practicable, I plough a thin sod or furrow, with a very sharp horse-plough, which I burn in small heaps and dissipate: considering it of little use but to destroy the tough sods of the eriophora, nardus stricta, and other plants, whose matted roots are almost imperishable.

The moss being thus brought to a tolerable dry and level surface, I then plough it in a regular furrow six inches deep, and as soon as possible after it is thus turned up, I set upon it the necessary quantity of marl, not less than two hundred cubic yards to the acre. As the marl begins to crumble and fall with the sun or frost, it is spread over the land with considerable exactness, after which I put in a crop as early as possible, sometimes by the plough, and at others with the horse-scurff or scarifier, according to the nature of the crop, adding, for the first crop, a quantity of manure, which I bring down the navigable river Irwell, to the borders of the moss, setting on about twenty tons to the acre. Moss land thus treated, may not only be advantageously cropped the first year with green crops, as potatoes, turnips, &c. but with any kind of grain; and as wheat has, of late, paid better to the farmer than any other, I have hitherto chiefly relied upon it, as my first crop, for reimbursing the expense."

4194. *The expense of the several ploughings, with the burning, sowing, and harrowing, and of the marl and manure, but exclusive of the seed, and also of the previous drainage and general charges, amounts to 18l. 5s. per acre; and in 1812, on one piece of land thus improved, Roscoe had twenty bushels of wheat, then worth a guinea per bushel, and on another piece eighteen bushels; but these were the best crops upon the moss. "Both lime and marl are generally to be found within a reasonable distance; and the preference given to either of them will much depend upon the facility of obtaining it. The quantity of lime necessary for the purpose, is so small in proportion to that of marl, that, where the distance is great, and the carriage high, it is more advisable to make use of it; but where marl is upon the spot, or can be obtained in sufficient quantity at a reasonable expense, it appears to be preferable." Roscoe is thoroughly convinced, after a great many different trials, that all temporizing expedients are fallacious; and "that the best method of improving moss land is by the application of a calcareous substance, in sufficient quantity to convert the moss into a soil, and by the occasional use of animal or other extraneous manures, such as the course of cultivation, and the nature of the crops, may be found to require."*

4195. *Roscoe's contrivance for conveying on the marl, seems peculiar. It would not be practicable, he observes, to effect the marling at so cheap a rate, (10l. per acre,) were it not for the assistance of an iron road or railway, laid upon boards or sleepers, and moveable at pleasure. Along this road the marl is conveyed in waggons with small iron wheels, each drawn by one man. These waggons, by taking out a pin, turn their lading out on either side; they carry about 15 cwt. each, being as much as could heretofore be conveyed over the moss by a cart with a driver and two horses.*

4196. *An anomalous mode of treating peat bogs was invented and practised by the late Lord Kaimes, which may be applicable in a few cases. This singular mode can be adopted only where there is a command of water, and where the subjacent clay is of a most fertile quality, or consists of alluvial soil. A stream of water is brought into the moss, into which the spongy upper stratum is first thrown, and afterwards the heavier moss, in small quantities at a time; the whole is then conveyed by the stream into the neighboring river, and thence to the sea. The moss thus got rid of, in the instance of Blair Drummond, in Perthshire, was, on an average, about seven feet deep. Much ingenuity was displayed in constructing the machinery, to supply water for removing the moss, previous to the improvement of the rich soil below. It required both the genius and the perseverance of Lord Kaimes, to complete this scheme; but by this singular mode of improvement, about 1000 English acres have been already cleared, a population of above 900 inhabitants furnished with the means of subsistence, and an extensive district, where only snipes and moor-fowl were formerly maintained, is now converted, as if by magic, into a rich and fertile carse, or tract of alluvial soil. (Code.) In The General Report of Scotland, Appendix, vol. ii. p. 38, will be found a detailed account of this improvement.*

SECT. VI. Of Marshes and their Improvement.

4197. *A tract of land on the borders of the sea or a large river, is called a marsh: it differs from the fen, bog, and morass, in consisting of a firmer and better soil, and in being occasionally flooded. Marshes are generally divided into fresh water marshes and salt water marshes; the latter sometimes called saltings or ings: fresh water marshes differ from meadows, in being generally soaked with water from the subsoils or springs.*

4198. *Fresh water marshes are often found interspersed with arable land, where springs rise, and redundant water has not been carried off; and may be improved by a course of ditching, draining, and ploughing. Where large inland marshes are almost constantly covered with water, or the soil is extremely wet, they may be drained, as large districts in the fens of Lincolnshire have been, and made highly valuable. The object, in that case, is, by embankments, draining, and other means of improvement, to convert these marshes into pasture or meadow, or even arable lands; and where such improvements cannot be accomplished, the most useful woody aquatics, as willows, osiers, &c. may be grown with advantage.*

4199. *Romney marsh* is one of the most extensive and fertile of fresh water marshes in Britain. It contains near 24,000 acres; besides which Walland marsh and Dunge marsh, which are comprised within the walls, contain the former 12,000, and the latter 8,000 acres. Boys inform us that "the internal regulations of these marshes are committed to the superintendence of exponditors. These are appointed by the Commissioners of Sewers, and are to take care that the repairs of the walls are maintained in due order, and that the costs attending the same be levied on each tenant according to the number of acres occupied by him; for which purpose they are to cause assessments to be made out, with the names of the occupiers, and the rateable proportions to be borne by them respectively; and these rates, which must be confirmed by the commissioners, are termed scots; and that when any occupier refuses to pay his scot, the exponditors can obtain a warrant from the commissioners empowering them to distrain for the same, as for any other tax." These marshes are both appropriated to the purposes of breeding and feeding.

4200. *Salt water marshes* are subject to be overflowed at every spring tide, or at other times, when by the violence of the wind, or the impetuosity of the tide, the water flows beyond its usual limits. Their goodness is in a great measure analogous to the fertility of the adjoining marshes; and the extent of them differs according to the situation. Embankments, as it is remarked in *The Code of Agriculture*, are perhaps the only means by which they can be effectually improved, especially when they are deficient in pasture. However, where pasture abounds, they are in some cases more valuable than arable lands, the pasture operating as a medicine to diseased cattle.

4201. *Marshes on the Thames*. In *The Agricultural Survey of Kent* it is asserted, that great profit is made by the renters of marshes in the neighborhood of London bordering on the Thames, from joisting of horses, the pasture being deservedly accounted salubrious to that useful animal; for which reason, such horses as have been worn down by hard travel, or long afflicted with the farcy, lameness, &c. have frequently been restored to their pristine health and vigor, by a few months' run in the marshes, especially on the saltings; but as every piece of marsh land in some measure participates of this saline disposition, so do they all of them possess, in a comparative degree, the virtues above mentioned, and for this reason the Londoners are happy to procure a run for their horses, at 4s. or 5s. per week. And another method practised by the graziers in the vicinity of London, is to purchase sheep or bullocks in Smithfield at a hanging market, which being turned into the marshes, in the lapse of a few weeks are not only much improved in flesh, but go off at a time when the markets being less crowded, have considerably advanced in price, and thus a twofold gain is made from this traffick; and as many of the wealthy butchers of the metropolis are possessed of a tract of this marsh land, they have, from their constant attendance at Smithfield, a perfect knowledge of the rise and fall in the markets, and consequently are enabled to judge with certainty, when will be the proper time to buy in their stock and at what period to dispose of them.

4202. *In various districts of the island* that are situated on the borders of the sea, or near the mouths of large rivers, there are many very extensive tracts of this description of land, which by proper drainage and enclosure may be rendered highly valuable and productive. This is particularly the case in Somersetshire and Lincolnshire, as well as that mentioned above. In the former of these counties, vast improvements have, according to Billingsley, as stated in his able *Survey*, been effected by the outling of ditches, for the purpose of dividing the property, and the deepening of the general outlets, to discharge the superfluous water. Many thousand acres which were formerly overflowed for months together, and consequently of little or no value, are now become fine grazing and dairy lands.

SECT. VII. Of Downs and other Shore Lands.

4203. *Downs* are those undulating smooth surfaces covered with close and fine turf met with in some districts on the sea-shore; the soil is sometimes sandy, and at other times clay or loam. In inland situations there are also down lands, as in Wiltshire, Lincolnshire, and Yorkshire; in the two latter counties they are called "wolds."

4204. *Sandy downs on the sea-shore*, are often more valuable in their natural state, than after cultivation. In a state of nature they frequently afford good pasture for sheep and rabbits, and at other times produce grasses that may be used as food for cattle, or as litter. But the great object should be to raise plants which contribute to fix these soils, and to prevent them from being drifted by the winds, which often occasion incalculable mischief. The most suitable plants for the purpose, are the *elymus arenarius*, *juncus arenarius*, *arundo donax*, *ononis communis*, *gallium verum*, *tussilago petasites*, and a variety of other creeping-rooted plants and grasses. Of woody plants, the elder is one of the best for resisting the sea breeze, and requires only to be inserted in the sand in large truncheons. Where the sands on sea-shores are mixed with shells, and not very liable to drift, if they can be sheltered by fences or an embankment, and sown with white clover, it will be found both an economical and profitable improvement.

4205. *Poor sandy soils in inland districts* are not unfrequently stocked with rabbits. When the production of arable lands are high, it is found worth while to break up these warrens and cultivate corn and turnips; but it frequently happens that taking the requisite outlay of capital, and the expenses and risk into consideration, they do not pay so well as when stocked with rabbits. Such lands are generally well adapted for planting; but in this, as in every other case where there is a choice, circumstances must direct what line of improvement is to be adopted.



4206. *Shores and sea beaches of gravel and shingle*, without either soil or vegetation, are perhaps the most unimprovable spots of any; but something may be done with them by burying the roots of the arenarious grasses along with a little clay or loamy earth. Of these, the best is the *elymus arenarius* (fig. 543 a), already mentioned; and *E. geniculatus* (b), and *sibiricus* (c), would probably succeed equally well. The last grows on the sandy wastes of Siberia, and the preceding is found on the shores of Britain.

CHAP. V.

Of the Improvement of Lands already in a state of Culture.

4207. *A profitable application of many of the practices recommended in the Chapters of this and the foregoing Book may be made to many estates which have been long under cultivation.* It is certain, indeed, that the majority of those who study our work will have that object more in view, than the laying out or improvement of estates *ab origine*. Few are the estates in Britain in which the farm lands do not admit of increased value, by rectifying the shape of fields, adjusting their size, improving the fences, draining the soil, or adding to the shelter; and few are the farmeries that may not be rendered more commodious. Of this, we shall give a few examples, after recognising general principles and modes of proceeding.

SECT. I. *Of the general Principles and Modes of Procedure, in improving Estates already more or less improved.*

4208. *The groundwork of improvement*, on which a practical man may tread with safety and full effect, is an accurate delineation of the existing state, together with a faithful estimate of the present value of the lands and other particulars of an estate to be improved. A general map of the appropriated lands, promptly exhibiting the several farms and fields as they lie, and showing the existing watercourses, embankments, fences, and buildings; the woodlands, standing waters, morasses, and moory grounds; the known mines and quarries; together with the commonable lands (if any) belonging to the estate, forms a comprehensive and useful subject of study to the practical improver. It is to him, what the map of a country is to a traveller, or a sea-chart to a navigator. If an estate is large, a faithful delineation of it will enable him in a few hours to set out with advantages, respecting the connexions and dependencies of the whole and its several parts, with which as many days, weeks, or months could not furnish him, without such scientific assistance. If on the same plan appear the rental value of each field or parcel of land, and the annual produce of each mine, quarry, woodland, and productive water in its present state, the preparatory information which science is capable of furnishing may be considered as complete. And it remains with the artist to study with persevering attention the subject itself, in order to discover the species of improvements of which it is susceptible, and the suitable means of carrying them into effect.

4209. *The species of improvements* that are incident to landed property are numerous. They may, however, be classed under the following heads: the improvement of the outline, and general consolidation of an estate by purchase, sale, or exchange: the improvement of the roads; of the mines and minerals; of the towns, villages, mills, and manufactories; of the waters; of the woods and plantations; and of the farmeries and farm lands. This last subject is the most common, and it is to it that we shall devote the succeeding section. To discuss the other species of improvement, as applied to old estates, would necessarily include so much of what has already passed in review in the foregoing Book, as to be wearisome to the reader.

SECT. II. *Of the Improvement of Farmeries and Farm Lands.*

4210. *Farm lands are of more or less value according to the means of occupying them.* Arable lands in particular require buildings and other conveniences, proportioned to the size of a farm. We frequently see tenants curbed in their operations, and incurring a waste of produce, through the want of sufficient homesteads. On the other hand, we sometimes observe a prodigality of expenditure on farm buildings; thus not only sinking money unnecessarily, but incurring unnecessary expenses in subsequent repairs, by extending homesteads beyond the sizes of farms. In some cases, therefore, it will be found necessary to curtail the extent of farm buildings, as large barns; in others to enlarge the yards, and in many to add and re-arrange the whole. The subject therefore may be considered in regard to design and execution; but as we have already treated fully on laying out new farmeries, we shall here offer only a few general remarks as to alterations.

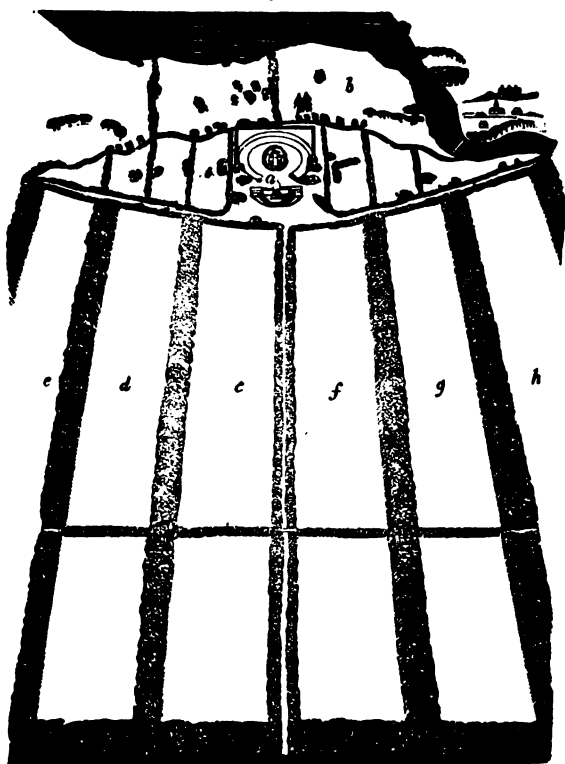
4211. *In improving the plan of a farmery* the given intention is first to be maturely considered, and the several requisites to be carefully ascertained. The given site is next

to be delineated, so as to show the existing buildings, yards, roadways, and entrances; and then, by maturely studying the plan alternately with the site itself, to endeavor to trace out the most suitable alterations; all the while keeping in view the perfection of arrangement, the situation and value of the existing buildings, and the expenses of alteration; returning to the charge repeatedly, until the judgment be fully satisfied. It is much easier to plan and erect a new farmstead, than to improve one which is already erected. The former requires science and ingenuity only; the latter good sense and judgment also.

4212. *In executing improvements on old farmeries* some difficulty occurs as to the incorporation of new and old materials. If the situation and plan are likely to be of permanent approval, the new erections may be made in the most substantial manner; keeping it in view that the old, which are repaired at the time, may afterwards be wholly renewed. But if the repairs and improvements are not to extend further than the duration of a lease, or till, by the expiry of various leases, some general plan of improvement can be determined on, then old materials or less permanent erections may be adopted.

4213. *As an example of adding part of a newly-enclosed common-field to a small anciently enclosed grass-farm* (fig. 544., we give the following case:

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4214. *The farmery (a) and ancient enclosed fields (b), are separated from the common field by a road, and bounded on the other side by a lake.* The soil is a soft black earth on a gravelly subsoil; the surface a gentle slope towards the lake. The farm-house is supposed to be already placed in this ancient part; and the object in view is to unite a large portion of the common field, when enclosed to each ancient farm, so as to get a fair rent for the lands at the least expense. The soil of this common field is a light poor sand, with nearly a flat surface. The circumstances of the country are favorable to large farms; the climate is dry, and the situation such as to require shelter. The number of acres to be enclosed and added to this farm is 1200. These will be most advantageously cultivated in six shifts of, 1, turnips (c); 2, barley (d); 3, artificial grasses (e); 4 and 5, the same (f, g); 6, wheat or oats (h). Each shift is proposed to be separated by a plantation

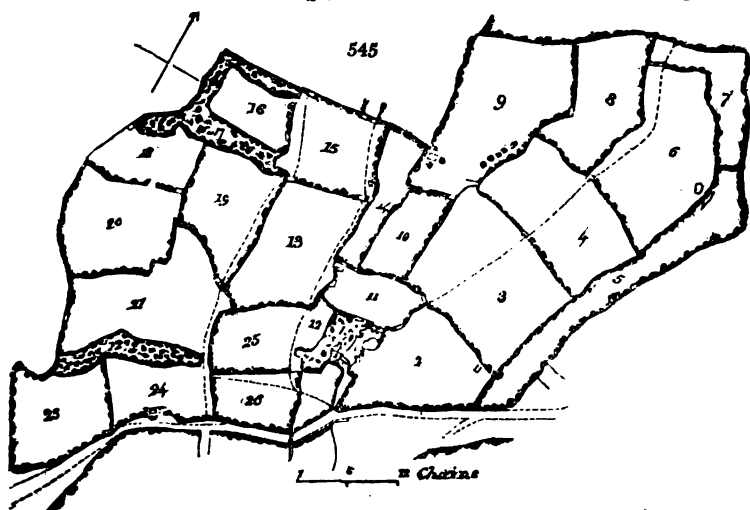
for shelter, and no inferior divisions are made. In two of the plantations are field-barns, sheds, &c. where the corn grown on one-half of the arable lands is threshed by a moveable threshing-machine, and the straw consumed by cattle. There are cottages at each of these barns for laborers to attend to the stock, &c. The ridges in each of the breaks or shifts are supposed to extend their whole length; or they may be ploughed as if the whole break were only one ridge, by which means not a moment is lost in turning at the ends, &c. Hereford or Devon oxen are supposed the beasts of labor on this farm.

4215. *In place of the above rotation*, wheat may be added after the second year of artificial grasses, and one shift kept entirely under saintfoin. This saintfoin division must of course be changed every sixth or seventh year. However, if a proper mixture of artificial grasses are sown, such as red, white, and yellow clover, rib-grass, burnet, saintfoin, timothy, cocksfoot, rye-grass, and soft grass, the produce will be superior to that from either saintfoin or lucern alone, on a soil such as this, or even perhaps on any soil. Every agriculturist of observation must be aware that the efforts of annual and biennial plants are powerful for a few years at first, and that they uniformly produce a greater bulk than perennials: the latter seem to compensate for this temporary bulk by a steady durable produce.

4216. *The old pasture near the house* is supposed to be irrigated from the upper part of the lake, by a cut passing near the house. These pastures are particularly advantageous for early lambs, milch cows, &c. and for stock in general in seasons of great drought.

4217. *Correcting the outlines of fields* is one of the most obvious sources of amelioration on many, perhaps on most estates. The advantages of proper sized and shaped enclosures have been fully pointed out, when treating of laying out farm lands, and in altering existing fences the same principles must be steadily kept in view; for though, unless by a total eradication of all the existing fences, every requisite may not be attainable, yet such a number may be gained as amply to compensate for the expense. In altering the shape and size of fields, besides the advantages resulting from the improvement in form, it will generally be found that a number of culturable acres may be added to the farm in proportion to the crookedness of the fences and their width. Better drainage and roads will also be obtained, and where ornament is an object, a park-like appearance may be produced by leaving as single trees a part of what may have stood in the eradicated hedge-rows.

4218. *As an example of improving the shape and size of fields*, we shall refer to a farm of 350 acres, situated in Middlesex. (fig. 545.) In this case, the fields were larger than

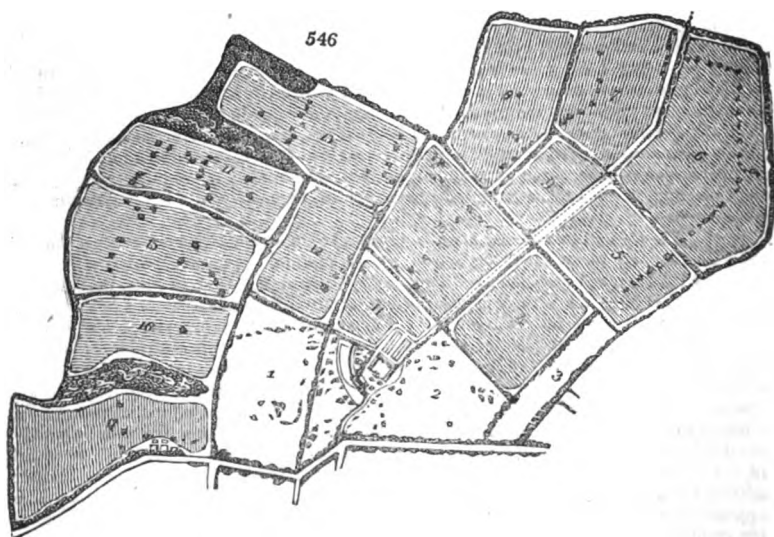


usual, but the fences were in many parts from ten to fifteen yards in width; more resembling strips of copse wood than fences, as they contained hazel, dogwood, black and white thorns, wild roses, brambles, and a variety of native shrubs. The lines of these fences were so ill calculated for carrying off the surface water, that in one half of the fields there were open gutters for the discharge of the water collected in the hedge-row ditches.

4219. In the centre of one field (25), for example, above an acre was rendered waste by the water from other fields (19, 20, and 21), which water, it is curious to remark, might, if led over the same acre agreeably to the principles of irrigation, have produced

annually at least two and a half loads of good hay, in place of annually rendering the produce of this acre unmarketable. The water of some fields (as 16, 18, and part of 19), ran in a diagonal direction through another (15), two acres of which might have been irrigated by it to advantage.

4220. In the farm when altered (*fig. 546.*), the fields are more uniform in shape and size; their sides are parallel, and better adapted for ploughing the lands in straight

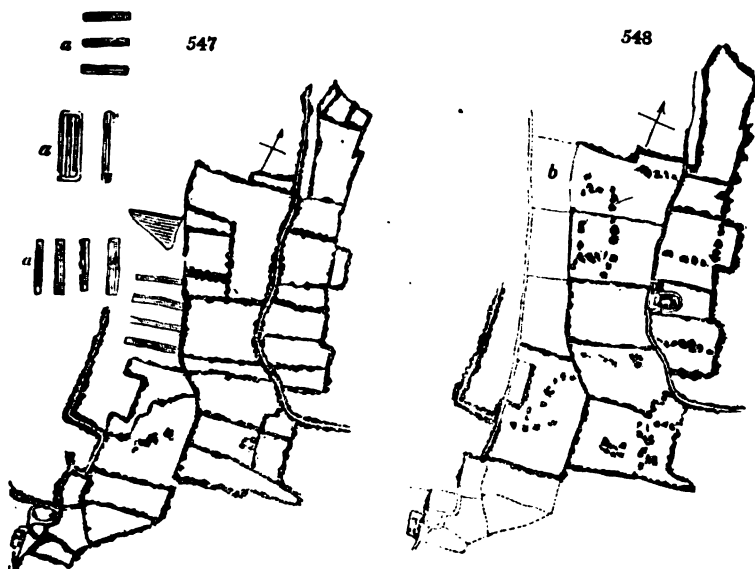


ridges. All the surface-water is carried off by the open fence drains. Access is had to every field by the shortest possible road from the farmery. Only two-thirds the number of gates formerly required are requisite. Fifty acres are rendered useful which were formerly lost, or pernicious, by occupying space for which rent was paid, and by harbouring insects and noxious weeds; and as much rich vegetable earth is obtained from the old hedge banks, as spread abroad in every direction may be said to manure at least ten acres. The whole is more open and healthful; and, from the number of single trees thrown into the fields, more elegant, and bearing a greater resemblance to a park. A part near the house (1, 2, 3) is in permanent pasture, and the rest (4, 5, 6, &c.) under a course of fallow, wheat, clover, beans, wheat.

4221. *As an example of altering the fields and consolidating a farm*, we submit the case of a meadow-farm, with the arable lands in a common field state. (*fig. 547.*) By an act of enclosure, these scattered arable lands (a), were exchanged for others adjoining the meadow grounds (*fig. 548 b*), and the whole rendered more compact and commodious. This farm being intersected by a public lane affords an example in which no private roads are wanting. The size and shape of the fields was improved, and the broad fences reduced as in the preceding case, and attended with the same advantages in an agricultural point of view.

4222. *But though in altering broad fences* there are obvious and indisputable advantages to the farmer, yet, as justly observed by Loch, gain is not every thing. "The fences on the Marquess of Stafford's estates," he says, "were liable to the same objection which is applicable to a great proportion of the counties of England. They are not composed of quick, at least but in a scanty degree; they for the most part consist of bushes, growing from the stump of every sort of forest-tree, intermixed with hazel, birch, hornbeam, maple, alder, willow, &c. They are planted on high and dry mounds, and thus are subject to constant decay. They occupy too much ground, provided agriculture alone was the occupation of life. But as they give great protection, when they thrive, to the game, they become an important object of preservation, inasmuch as every thing must be of consequence which contributes to the sport, and has the effect of retaining the gentry of England much upon their estates. For this reason, it may occasionally be proper to consider of the best way to preserve these hedges at the least expense, in place of substituting more perfect ones in their stead; nor should one object exclusively be attended to in the agricultural improvements of so great and so wealthy a country."

4223. *When farm-lands are exposed to high winds*, interspersing them with strips or masses of plantation is attended with obviously important advantages. Not only are such lands rendered more congenial to the growth of grass, and corn, and the health of pasturing animals, but the local climate is improved. The fact, that the climate may be thus improved, has, in very many instances, been sufficiently established. It is, indeed, astonishing how much better cattle thrive in fields even but moderately sheltered than



they do in an open exposed country. In the breeding of cattle, a sheltered farm, or a sheltered corner in a farm, is a thing much prized; and, in instances where fields are taken by the season for the purpose of fattening them, those most sheltered never fail to bring the highest rents, provided the soil be equal with that of the neighboring fields which are not sheltered by trees. If we inquire into the cause, we shall find, that it does not altogether depend on an early rise of grass, on account of the shelter afforded to the lands by the plantations; but, likewise, that cattle which have it in their power, in cold seasons, to indulge in the kindly shelter afforded them by the trees, feed better; because their bodies are not pierced by the keen winds of spring and autumn; neither is the tender grass destroyed by the frosty blasts of March and April. (*Plant. Kal.* p. 121.)

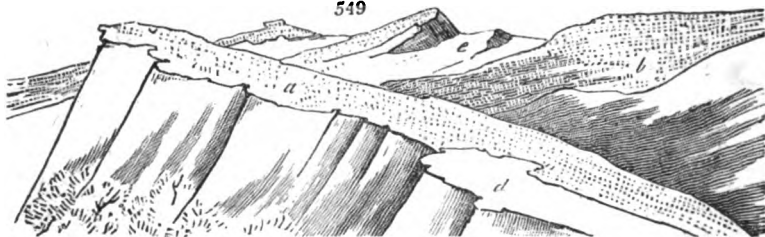
4224. *The operation of skreen plantations*, in exposed situations, Marshal observes, is not merely that of giving shelter to the animals lodging immediately beneath them; but likewise in breaking the uniform current of the wind, — shattering the cutting blasts, and throwing them into eddies: thus meliorating the air to some distance from them. Living trees communicate a degree of actual warmth to the air which envelopes them. Where there is life there is warmth; — not only in animal, but vegetable nature. The severest frost rarely affects the sap of trees. Hence it appears, that trees and shrubs properly disposed, in a bleak situation, tend to improve the lands so situated, in a threefold way, for the purposes of agriculture: namely, by giving shelter to stock; by breaking the currents of winds; and by communicating a degree of warmth or softness to the air, in calmer weather.

4225. *The proper disposal of skreen plantations* for this purpose is in lines across the most offensive winds, and in situations best calculated to break their force. Placed across valleys, dips, or more open plains, in bleak exposures, they may be of singular use. Also on the ridges, as well as on the points, and hangs, of hills.

4226. *The width of skreen plantations* ought generally to be regulated by the value of the land for agricultural uses, and the advantages of the situation for the sale and delivery of timber. In ordinary cases, from two to four statute poles may be considered as an eligible width.

4227. *The form of plantations* for shelter, however, will not in every case be that of a stripe or belt of uniform width. In hilly, rocky, and other situations, different forms will suggest themselves according to the situation and the objects in view. In rocky abrupt sites (*fig. 549.*), the plantation will consist of a number of masses (*a, b, c,*), of forms determined by the rocks and precipices, among which some of the most valuable pasture may be left as glades (*d, e,*) for use, effect, and for the sake of game. Strips and hedges for sheltering, or separating arable lands, should be formed as much as possible in straight and parallel lines, in order not to increase the expense of tillage.

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by short and irregular turnings. Straight parallel strips, on irregular surfaces, have a more varied appearance at a distance, than strips ever so much varied on a flat surface; for, in the former case, the outline against the sky is varied as much as that on the earth. In extensive, hilly pastures, in which it is often desirable to produce shelter, and at the same time to plant only the most rocky and unproductive spots, the forms may be of the most irregular description; and by planting chiefly on the eminences and slopes (fig. 550.), shelter will be most effectually produced, the pasture improved, the least valuable ground rendered productive in copse or timber, and the greatest richness and picturesque beauty conferred on the landscape. There are some fine examples of this on the hilly districts of Fife-shire; there, on many estates where nothing was sought for but profit and shelter, the greatest beauty has been produced; and the picturesque tourist now passes through glades and valleys, pastured by well-fed cattle and sheep, enlivened by rocks, thickets, hanging-woods, and occasional rills and lakes. Fifty years ago scarcely a tree was to be seen, and only the most inferior descriptions of live stock.

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4228. *The species of woody plants* best adapted for shelter, are the rapid growing and evergreen trees, as the Scotch pine, and such as are at the same time clothed with branches from the ground upwards, as the spruce fir, the best of all trees for shelter, unless the situation is very elevated. Among the deciduous trees, the fast-growing branchy sort are most desirable, as the larch, birch, poplar, willow; in very elevated situations, the birch, mountain-ash, and Scotch-pine, exposed to the sea breeze, the elder and sycamore. To maintain a branchy, leafy screen from the ground upwards, intermix trees and shrubs which stole; or such as grow under the shade and drip of others, as the holly, hazel, dog-wood, box, yew, &c. To produce shelter, and yet admit of the growth of grass below the trees, prune any sort to single stems, and use chiefly deciduous sorts.

4229. In *bleak and barren situations*, Marshal observes, the larch will generally be found the most profitable, as timber. But, being deciduous, it does not in winter, when its services are most wanted, afford so much shelter as the common pine. A skreen, to shelter live stock, should be close at the bottom. It is, otherwise, injurious rather than beneficial. Not only the blast acquires additional current, but snow is liable to be blown through, and to be lodged in drifts on the leeward side, to the annoyance and danger of sheep that have repaired to it for shelter. A larch plantation margined with spruce firs, and these headed at twelve or fifteen feet high, would afford the required shelter, for a length of years. The firs, or pines, thus treated, would be induced to throw out lateral boughs, and feather to the ground: while the larches, in their more advanced state of growth, would, by permitting the winter's winds to pass through the upper parts of the skreen, break the current and mellow the blast.

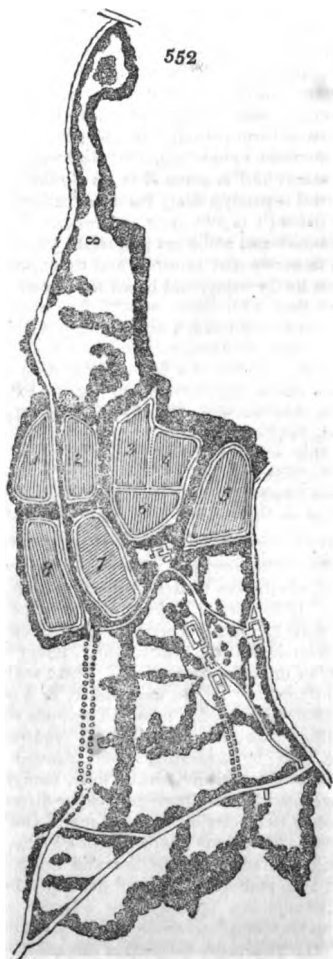
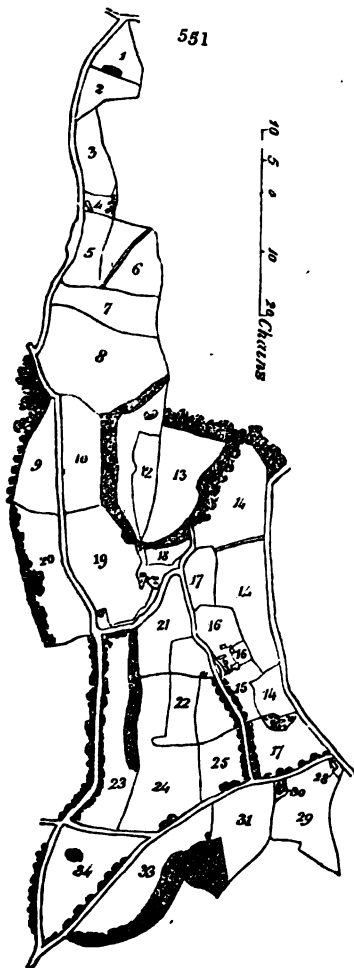
4230. In *more genial situations*, the beech, by retaining its leaves in winter, especially while it is young, forms a valuable skreen. If the outer margins were kept in a state of coppice wood, and cut alternately, and the middle ranks suffered to rise as timber trees, the triple purpose of skreen plantations might be had in an eminent degree, and almost in perpetuity.

4231. In *deep-soiled, vale districts*, which not unfrequently want shelter, skreens of oak might be managed in a similar way. Hollies, or other hardy evergreens, planted as

underwood, in groves of either of the above descriptions, would, if suitable situations were assigned them, assist much in this intention.

4232. *A tall impervious fence* is, for the purpose of shelter to pasturing stock, nearly equal to a depth of coppice wood, and infinitely preferable to an open grove of timber trees; beside its additional use as a fence. There appears, one species of fence which is peculiarly adapted to this purpose. This is the coppice mound hedge of Devonshire and South Wales; namely, a high wide bank or mound of earth, planted with coppice woods. This becomes, immediately on its erection, a shelter and a guard to pasture grounds.

4233. *The method of forming fences of this intention* is that of carrying up a stratum of earth, between two sod facings, "battering," or leaning somewhat inward, to the required height; and planting on the top the roots and lower stems of coppice plants, gathered in woods, or on waste grounds; or with nursery plants, adapted to the given situation. If the mound be carried to a full height, as five or six feet, and about that width at the top, and this be planted with strong plants, with stems cut off about two feet above the roots (in the usual practice of Devonshire), a sufficient fence is thus immediately formed against ordinary stock. But if the bank be lower, or if nursery plants be put in, a slight guard, run along the outer brink, on either side, and leaning outward, over the face of the mound, is required (especially against sheep) until the plants get up. If a hedge of this kind be raised as a *plantation fence*, (especially on the lower side of a slope)



the outer side only requires to be faced with sods; the hedge plants being set in a rough shelving bank, on the inner side.

4234. *The species of hedge woods*, proper for mound fences, depends entirely on the soil and situation. On mounds of bad soil, in a bleak situation, the furze alone affords much shelter, and a good fence. The sides being kept pruned, so as to show a close firm face rising above the top of the bank, it is a secure barrier, even against the wilder breeds of Welsh sheep. The beech is commonly planted in high exposed situations; and in places more genial to the growth of wood, the hazel, the ash, and the oak are the ordinary plants of hedge mounds. The willow tribe have a quality which recommends them, in situations where they will flourish: they grow freely from cuttings, or truncheons set in the ground; whereas to secure the growth of ordinary coppice woods, rooted plants are required. The rock-willow (*Salix caprea*) will grow in high and dry situations.

4235. *On thin-soiled stoney surfaces*, tall mounds are difficult to raise; and there *stone walls* are not only built at a small expense, but are convenient receptacles for the stones with which the soil is encumbered. But a stone wall, unless it be carried up to an inordinate height, at a great expense, is useless as a skreen; may be said to be dangerous as such, in a bleak exposed situation, for as soon as the drifting snow has reached the top of the wall, on the windward side, it pours over it, and inevitably buries the sheep which may be seeking for shelter on the leeward side. Hence, in a situation where shelter is required, it is necessary that a stone fence should be backed with a skreen plantation.

4236. *To plant trees for shade* may in some cases be requisite for agricultural purposes. Where this is the case, close plantations are seldom desirable, a free circulation of air being necessary to coolness; therefore trees with lofty stems, and large heads, pruned to single stems are preferable: the oak, elm, chestnut, and beech, for thick shade; the plane, acacia, and poplar, for shade of a lighter degree.

4237. *An example of sheltering a hill-farm by plantation*, and at the same time improving the shape and size of fields, shall next be given. No farming subject affords better opportunities of introducing hedge-rows, and strips of planting than hill-farms. The one under consideration (*fig. 551.*) is a small estate farmed by its owner; it consists of nearly 370 acres; and is situated in an elevated, picturesque part of a central English county. The soil is partly a flinty loam or chalk, and partly a strong rich soil, incumbent on clay. The fields (1 to 34), are very irregular, bounded by strips of timber and copse. By the alterations and additions proposed (*fig. 552.*), all the most hilly and distant spots will be kept in permanent pasture; and the exposed and abrupt places, angles, &c. planted chiefly with oaks for copse, and beech for timber and shelter.

CHAP. VI.

Of the Execution of Improvements.

4238. *The mode in which improvements are executed* is a point of very considerable importance, and may materially affect their success as well as their expense. We shall first consider the different modes of execution, and next offer some general cautions to be held in view in undertaking extensive works.

SECT. I. *Of the different Modes of procuring the Execution of Improvements on Estates.*

4239. *The necessary preliminary to the execution of an improvement*, is a calculation of the advantages to arise from it, and an estimate of the expense of carrying it into effect. If the former, taken in their full extent, do not exceed the latter, the proposed alteration cannot, in a private view, be considered as an improvement. The next point to be ascertained is the practicability, under the given circumstances of a case, of executing the plan under consideration. There are three things essential to the due execution of an improvement. 1st, an undertaker, or a person of skill, leisure, and activity, to direct the undertaking; 2d, men and animals with which to prosecute the work; 3d, money, or other means of answering the required expenditure. A deficiency in any one of these, may, by frustrating a well planned work after its commencement, be the cause, not only of its failure, but of time, money, and credit being lost. — Improvements may be executed by the proprietor, either directly, gradually, by economical arrangements, or remotely to ascertain extent, by moral and intellectual means.

4240. *To execute improvements directly*, all that is necessary is to employ a steward or manager of adequate abilities and integrity, and supply him with the requisite plans, men, and money. This will generally be found the best mode of forming new roads, new plantations, opening new quarries or mineral pits, altering the course of waters, and all such creations or alterations as are not included in the improvement of farm lands.

4241. *To procure the gradual execution of improvements on farm lands*, various arrange-

ments may be made with the tenants : for example, by granting long leases ; letting them find the requisites of improvement, and take the advantages during their terms ; by granting shorter leases, with a covenant of remuneration for the remainder of such improvements as they have made, at the time of quitting ; by granting leases, at a low rent, for the first years of the term, to give the tenants time and ability to improve at their own expense ; by advancing money to tenants at will, or, which is the same, making allowances of rent for specified improvements, to be executed by them under the inspection and control of the manager, they paying interest for the money advanced, or allowed ; by employing workmen on tenanted farms ; the tenants in like manner paying interest on the money expended. The usual interest, till lately, was six per cent. ; thus estimating the value of the improvement at sixteen years purchase.

4242. *The moral and intellectual means of improving farm lands* consists, as Marshal has observed, in enlightening the minds of tenants. Though this mode is but of slow operation, and respects more improvements in modes of culture, than such as require great outlay ; yet it deserves notice in this place, as necessary to second the efforts of the landlord.

4243. *Farmers, as moral and intellectual agents*, may be divided into reading men, and illiterate beings ; the first class derive hints for improvement from books ; but the second can only, if at all, derive benefit from example.

4244. With respect to *improving farmers by books*,—agricultural newspapers, magazines, and county surveys, are probably what would be read with most eagerness, and as such works abound in statements of what actually has taken place in different situations, by farmers like themselves, perhaps they are the most likely to stimulate to exertion. Historical relations of the agriculture of other countries are also generally interesting to agriculturists, and though no great professional benefit is to be derived from them, yet they tend to enlarge and liberalize the mind, and promote a taste for knowledge. Under these circumstances it may be worthy of consideration whether an agricultural library might not be established in the steward's office of very extensive estates for the use of the tenants and all other persons belonging to the estate who chose to read from it.

4245. *The establishment of schools* for the children of the lower class of tenants, and of cottagers of every description, is an obvious and important source of moral and intellectual improvement ; and considering it as decided by experience and the most competent judges, that the education of the lower classes will tend greatly to their amelioration and the benefit of society at large, we are of opinion that wherever they are not already established, they should be introduced. Working schools, somewhat in the German manner (343.), both for boys and girls, would also be a material improvement in such districts as are behind in a taste for cleanliness, fire-side comforts, cookery, and dress.

4246. *Examples as stimuli to improvement* may be exhibited in various ways ; by letting a farm to a tenant of superior energy, or from a more improved district ; by exhibiting improved implements and operations on one particular farm ; by an itinerant ploughman of abilities, accompanied by a smith and carpenter, and with some implements, to go round the estate and instruct each tenant on his own farm ; and finally, and perhaps preferably, by inducing every farmer to make a tour into some other district once a year.

4247. *In addition to these modes*, appropriate as we consider for two different classes of tenants, Marshal suggests the following as calculated to insure a spirit of improvement among all farmers not of sufficient energy and intelligence. They are to be adopted by a proprietor, or by the manager of an estate, who has a knowledge of rural affairs, and who possesses the good will and confidence of its tenantry, in various ways.

4248. *By personal attention only* much is to be done. By reviewing an estate, once or twice a year ; by conversing with each tenant in looking over his farm ; and by duly noticing the instances of good management which rise to the eye, and condemning those which are bad ; vanity and fear, two powerful stimulants of the human mind, will be roused, and an emulation be created among superior managers ; while shame will scarcely fail to bring up the more deserving of the inferior ranks. If, after repeated exhortations, an irreclaimable sloven be discharged as such, and his farm given to another, professedly for his superior qualifications as a husbandman, an alarm will presently be spread over the estate, and none, but those who deserve to be discharged, will long remain in the field of bad management.

4249. *Even by conversation*, well directed, something may be done. If, instead of collecting tenants to the audit, as sheep to the shearing, and sending them away, as sheep that are shorn ; — or if, on the contrary, instead of providing for them a sumptuous entertainment, and committing them to their fate, in a state of intoxication ; — a repast, suited to their conditions and habits of life, were set before them ; — and if, after this, the conversation were to be bent towards agriculture, by distributing presents to superior managers, specifying the particulars of excellence, for which the rewards or acknowledgments were severally bestowed ; — a spirit of emulation could not fail to take place among

the higher classes; while the minds of the lower order of tenants, and of the whole, would be stimulated and improved by the conversation.

4250. *By encouraging leading men*, in different parts of a large estate, — men who are looked up to, by ordinary tenants; — by holding out these as patterns to the rest; — by furnishing them with the means of improving their breeds of stock; by supplying them with superior varieties of crops, and with implements of improved constructions: and, in reclusive and backward districts, much may be done by tempting good husbandmen, and expert workmen, from districts of a kindred nature, but under a better system of cultivation, to settle upon an estate.

4251. *By an experimental farm*, to try new breeds of stock, new crops, new implements, new operations, and new plans of management; such as ordinary tenants ought not to attempt, before they have seen them tried. To this important end, let the demesne lands of a large estate, or a sufficient portion of them, be appropriated to a nursery of improvements, for the use of the estate; to be professedly held out as such, and be constantly open to the tenants; more particularly to the exemplary practitioners, the leading men of the estate, just mentioned; who, alone, can introduce improvements among the lower classes of an ignorant and prejudiced tenantry: it is in vain for a proprietor to attempt it. On the contrary, the attempt seldom fails to alarm, disgust, and prevent the growth of spontaneous improvements.

4252. *Under the present plan of demesne farming*, the tenants see expensive works going forward, which they know they cannot copy, and hear of extraordinary profits, by particular articles, which they are certain cannot be obtained by any regular course of business. They therefore conclude that the whole is mere deception, to gain a pretext for raising the rents of their farms above their value. Whereas, if the demesne lands were held out, as trial grounds, for their immediate benefit, and conducted, as such, in a manner intelligible to them, they would not fail to visit them. Instead of large proprietors attempting to rival the meanness of their tenants, in farming for pecuniary profit, which, on a fair calculation, they rarely, if ever, obtain; let their views in agriculture be professedly and effectually directed toward the pecuniary advantages of their tenants: for from these, only, their own can arise, in any degree that is entitled to the attentions of men of fortune. Instead of boasting of the price of a bullock, or the produce of a field, let it be the pride of him who possesses an extent of landed property, to speak of the flourishing condition of his estates at large, the number of superior managers that he can count upon them, and the value of the improvements which he has been the happy means of diffusing among them. Leave it to professional men, to yeomanry and the higher class of tenants, to carry on the improvements, and incorporate them with established practices; to prosecute pecuniary agriculture in a superior manner, and set examples to inferior tenantry. This is strictly their province; and their highest and best view in life. It has been through this order of men, chiefly or wholly, that valuable improvements in agriculture have been brought into practice, and rendered of general use.

4253. *The possessor of an extent of territory has higher objects in view*, and a more elevated station to fill. As a superior member of society, it may be said, he has still higher views than those of aggrandizing his own income. But how can a man of fortune fill what may well be termed his legitimate station in life, with higher advantage to his country, than by promoting the prosperity of his share of its territory; by rendering not one field, or one farm, but every farm upon it productive? This is, indeed, being faithfully at his post. And it is a good office in society which is the more incumbent upon him, as no other man on earth can of right perform it; valuable as it is to the public.

SECT. II. General Cautions on the Subject of executing Improvements.

4254. *No work can be prudently commenced until the plan be fully matured*, not in idea only, but in diagrams, and in models, if the subject require them; in order that every bearing, and every hinge, may be sufficiently foreknown: the site of improvement being reverted to, again and again, with the draught or the model in hand; until the judgment be satisfied, and the mind be inspired with confidence. If a proprietor has not yet acquired sufficient judgment within himself, let him consult some one man, or one council of men, in whose knowledge and judgment he can confide; and thus fix a rallying point. Having brought his plan to a degree of maturity, in this private manner, he may then venture to publish it; and endeavor to improve it, by the advice of its friends, and the animadversions of its enemies.

4255. *If a proprietor wants judgment himself, and a friend to supply it*, let him not attempt the more difficult works of improvement. Yet how often we see, both in public and private life, men engaged in arduous undertakings, embarked on the wide ocean of business, without rudder or compass to guide them: depending on casual information, to help them on their way: sponging, with porous brain, the minds that are bedewed with the knowledge they require. But having no store of their own to assimilate it with, it presently evaporates. They are consequently ever of opinion with the last persons they converse with. Such men's decisions and operations are always wrong: and for an obvious reason. They consult those who are best able to inform them, first: and receive their last impressions from those who are least capable to give them. Men who have neither judgment in themselves nor any standard of practice to rally at, are liable to be led astray by the plausible schemes of theorists, the greater part of whom know nothing of the practical part of business; and by their calculations both of expense in the outlay, and of profit in the return, deceive both themselves and their friends or employers; some also may have sinister designs in view; though we believe the errors of speculative men are in most cases owing to their being endowed with more of the imaginative than of the judging faculty.

4256. *The execution of the different improvements, of which an estate has been found susceptible being determined on, it is always advisable to begin with one which is obvious; which may be effected with the greatest certainty; which will repay most amply the expenses of carrying it into effect: or which leads to other improvements; as embankment, drainage, &c.* To attempt a doubtful project, while plans which are obvious and certain, remain unexecuted, to try experiments before the list of known improvements has been gone through, is seldom to be recommended; though it might sometimes turn out to be right.

4257. *All rural operations are more or less public, and as it were performed on a stage; and spectators fail not to criticise.* If an experiment should prove abortive, or a proposed improvement turn out to be false, the ardor of the improver will be liable to be damped, his people to be discontented (as partaking in the discredit), and the expecting public around him, to be disappointed. A few miscarriages, in the outset, might frustrate the best intentions, and the most profitable schemes. But if, by prosecuting plain and certain improvements, a man once gain his own confidence, as well as that of the people about him, he may then venture to explore less beaten paths. And this he will be able to do with greater caution, and more probability of success, by the experience that he has already gained: this being a further motive for pursuing the line of conduct here suggested.

4258. *All works of improvement should be executed with vigor.* Many fault in the midst of well planned works, either through the want of foresight or of business-like exertion, in consequence the money already expended lies dead, and the works are injured by the delay. Some works, as embankments and drainages, may be ruined by the slightest neglect or relaxation, and indeed, as Marshal observes, we see in every department of the kingdom, these and other works deserted and left to moulder into nuisances or disreputable eyesores.

4259. *In carrying on a work, execute every thing substantially, and in a workman-like manner.* Too often a false economy leads to the subversion of this principle. To save a few pounds in the first cost, materials of an inferior quality are laid in, or an insufficient quantity used, to give the required substance and strength to the work. By either of these imprudences, its duration is abridged; and the eventual loss, by repairs and renewal, may be ten times greater than the sum injudiciously saved in the original erection. Nevertheless, to increase the evil of these ill-judged savings, inferior workmen are employed, or sufficient workmen at inferior prices, at which they cannot afford to make good work; nor can a superintendant urge them to make it under such circumstances. Consequently the work is ill performed, its duration is still more abridged, and a further loss, by injudicious saving, is incurred.

4260. *There are cases in which temporary works only are required.* A lease-tenant, for instance, wants to make an improvement which will last as long as his lease, without caring about its further duration. In such a case, it may be well-judged frugality and admissible "cleverness in business," to work up cheap materials in a cheap way. But it seldom can be right in the proprietor of an hereditary estate, whose interest in it may be said to be perpetual, to proceed in the same manner. His best policy is to take favorable opportunities of laying in good materials at moderate prices, to use them when duly seasoned, and to employ good workmen at fair prices, such as cannot furnish them with an excuse for being guilty of bad workmanship, and such as will warrant their employer to urge and enforce that which is good.

4261. *Accomplish one work before another is commenced.* A work may be considered as accomplished when the chief difficulties are surmounted, and cost expended; and till this is the case, it cannot be prudent to embark in another. By avoiding embarrassments, the execution of improvements becomes a present pleasure, as well as a source of future profit. No half-finished works are left as monuments of disgrace to an estate and its owner. No time nor interest of money is lost. Every work is brought into action and profit as it is finished; and if, as it frequently will happen with the most prudent calculators, it has exceeded the estimated sum which was set apart for it, due time may be taken to let the fund of improvement accumulate, so as to enable it to discharge the arrear, and to furnish, as they may be wanted, the estimated sums which the succeeding work may require.

BOOK IV.

OF THE MANAGEMENT OF LANDED PROPERTY.

4262. *The management of an extensive landed estate, like that of every other great property, is a business both of talent and integrity.* In former times, when every proprietor

may be said to have cultivated the whole of his agricultural territory, it constituted his whole occupation, when not engaged in war; or required a host of managers if he was a man of the first rank. On the continent, and especially in Russia and Hungary, where estates are of enormous extent, and wholly farmed by the proprietor, the largest estates, as we have seen (609.), are managed by a court of directors, and an executive department, with a numerous body of superintendant officers, artists, and artisans. A better system is now adopted in this country, in consequence of the creation of professional farmers, who, taking large portions of territory from the owner for a certain number of years at a fixed rent, and on certain stipulations, for mutual security, occasion little more trouble to the proprietor, during that period, than receiving payments. Hence it is, that the management of estates in Britain, though important, is a more simple business than in any other country.

4263. *Where there are only tenanted holdings*, the business of management is very simple; where there are woodlands, it requires a person to look after that department; and where there are waters, quarries, and mines, a greater number of subordinate officers are requisite. But what often occasions most expense, and at the same time is attended with the least profit, is the management of the abstract rights belonging to an estate; such as tithes, manorial rights, quit-rents, and other antiquated trifles, which require courts to be holden, and lawyers and other officers to be called in to assist. The only British author who has digested the business of managing estates into a regular system, is Marshall, and we shall follow him in considering this subject: — 1st, As to the superintendants on the executive establishment of an estate; and 2d, As to the general business of management.

CHAP. I.

Of the Superintendants, or Executive Establishment of an Estate.

4264. *Though every man who cannot manage his own estate in all important matters, deserves to lose it*; yet as extensive proprietors generally have their properties situated in different parts of the country, and have besides public duties to attend to, certain subordinate managers become necessary. In *The Code of Agriculture*, it is stated, that no individual having a large estate is equal to the task of managing it, unless he is in the prime of life, dedicates his whole time to the business, and gives up every other occupation. It is there stated to have been found expedient by the proprietor of an estate of great extent, to nominate two or three commissioners to assist him in its management. Under the superintendence of such commissioners, it is said, the affairs of a great property would be as well conducted, as on the best managed small or moderate sized estates; while the duties of the proprietor would principally be to carry these exercises of true benevolence into effect, which would consist in softening severe decisions; or in granting those marks of approbation and reward which, when bestowed by the proprietor himself, are the most likely to produce beneficial consequences. (*Code, &c. App. 58.*) Such may be the case on a few estates in the British isles not yet brought into a regular system of improvement, and about to be remodelled, of which a grand example occurs in the immense property of the Marquess of Stafford; but in the great majority of cases, a manager to each separate estate, of qualifications suited to its extent and duties, and a general receiver and controller in the capital or metropolis, (if the proprietor and his banker cannot effect these duties between them,) are all that is requisite. We shall first offer a few remarks on the qualifications and duties of managers, and next on the place of business and its requisites.

SECT. I. Of the Steward or Manager of an Estate, and his Assistants.

4265. *The head manager of an estate* ought unquestionably to be the proprietor himself, or his representative, if a minor or otherwise incompetent. Next to the proprietor is his acting man of business, with proper assistants; together with such professional men as the circumstances of business may render necessary as advisers. A tenanted estate differs widely from other species of property; as giving power and authority over persons as well as things. It has, therefore, a dignity, and a set of duties, attached to it, which are peculiar to itself. A man who receives ten thousand pounds a year from the public funds, for instance, is an insulated being, compared with him who receives the same income from landed property; who is one of society's best members: provided his affairs are judiciously conducted. On the contrary, if, regardless of the dignity and the duties of his station, he lives but to dissipate his income, leaving the government of his estates and their inhabitants, to those whose interest and honor are unconcerned in their welfare, or to those whose best interests lie in their derangement, he becomes at once

an enemy to himself, to his family, and to the community. As unpardonable it would be in the possessor of a kingdom to be ignorant of state affairs, and unmindful of the ministers who reside about his court ; — or in the commanding officer of a regiment to be a stranger to his men, — a priest to his parishioners, — or a shepherd to his flock ; — as for the possessor of a tenanted estate to be ignorant of territorial concerns, and a stranger to his lands and their occupiers.

4266. Though it be an *essential part of the duty of a man of fortune to be intimately acquainted with his own affairs*, it does not follow that he should be absorbed in them, and neglect his duties as a superior member of society. In all matters of government and command, subordination is essential to good order and success. A commander in chief does not act as pioneer, nor does a naval commander reef his sails, or heave his anchor. Each has his subordinate officers to convey his commands, and men to execute them. But it is essentially necessary that the former should be well acquainted with military, the latter with naval affairs. Every heir apparent, therefore, to a large landed property, should be regularly, or at least more or less, bred up in the knowledge of rural affairs, so as to fill with honor and profit the high station he has in view. But if the possessor of an estate has not been fortunately initiated in the knowledge which belongs to his station, the task of acquiring it is far from great.

4267. *On a large estate we generally find a resident manager*, a land steward, a man who has some knowledge of what is termed country business, and who acts under the control of his employer, or of a confidential friend, who is more conversant in rural concerns ; or perhaps of a law agent, who knows less of them ; or such residing steward, especially of a detached estate which lies at some distance from the residence of its proprietor, acts without control. In the last case, if he is a man of judgment, it is fortunate both for the landlord and tenant. But, on the contrary, if such possessory manager wants those requisite qualifications, the consequence becomes mischievous to the lands, their occupiers, their proprietors, and the community.

4268. *The requisite acquirements of an acting manager*, according to Marshal, are a knowledge of agriculture, surveying, planting, some knowledge of mechanics, natural history, and a master of accounts. Agriculture is the only firm foundation on which the other required attainments can be securely reposed. It is not more essentially valuable in the superintendence, than in the improvement of an estate. It is difficult to become an accurate judge of the value of lands without a practical knowledge of their uses ; nor can any man without it, properly appreciate the management of occupiers, much less assist them in correcting their errors, and improving their practice.

4269. *Land-surveying* is a requisite qualification. Not so much however, for the purpose of measuring and mapping an estate, at large, as for checking and correcting the works of professional men, as well as to assist in laying out its lands to advantage.

4270. *Planting*, and the management of woodlands, are acquirements that cannot be dispensed with. Nor should his knowledge and attention be confined to the surface of the estate entrusted to his care ; he ought to have some acquaintance with natural history, chemistry, and experimental philosophy, to enable him to form just notions on the subject of the subterrene productions which it may contain.

4271. *Some knowledge of mechanics*, and other sciences that are requisite to the business of an engineer, may be highly useful in prosecuting the improvements incident to landed property.

4272. *A competent knowledge of rural architecture*, the doctrine of the strength of materials, and the superintendence of artificers, may be said to be of daily use.

4273. *A thorough knowledge of accounts* is essentially requisite to the manager of a landed estate.

4274. He should be a *man of good character, of upright principles, and conciliatory manners* ; to set an example of good conduct to the tenants, and to become their common counsellor and peace-maker, in those trifling disputes which never fail to arise among the occupiers of adjoining land ; and which too frequently bring on serious quarrels and lawsuits, that end in the ruin, not only of themselves, but of the tenements they occupy. A proprietor has, therefore, an interest in checking such disputes in the bud. And no man can do this with so much effect, as a manager in whom they have a proper confidence ; and who possesses a due share of popularity on the estate.

4275. *The acting manager requires certain assistants* on a large estate ; especially if it lies in a detached and scattered parts. Those in general use, are a ground officer and clerk.

4276. *A land-reeve, woodward, or ground officer*, is required on each district or department of a large estate ; to attend, not only to the woods, and hedge-timber, but to the state of the fences, gates, buildings, private roads, driftways, and watercourses ; also to the stocking of commons (if any), and encroachments of every kind ; as well as to prevent, or detect, waste and spoil, in general, whether by the tenants of the estate, or others ; and to report the same to the manager.

4277. *The office clerk, book-keeper, or under steward*, is employed to form registers, make out rentals, &c. and keep the accounts of the estate ; as well as to assist the manager in his more active employments ; also to act as his substitute in case of sickness, or absence ; and to become his successor in the event of his death, or other termination of his stewardship.

4278. *A law assistant, solicitor, or attorney*, may next be considered as requisite to the good management of a landed estate. For although much is to be done by judicious regulations, and the timely interposition and advice of a resident manager, such are the

frailties of human nature, that, in a state of civilised society, and of property, legal assistance will sometimes be necessary. The error of country gentlemen consists, not in employing lawyers, but in committing the management of their landed estates to them.

4279. *In the feudal system*, under which every manor court was a court of law, we may perceive the origin of law land-stewards. It is allowed by the best agricultural writers in Europe (*Chateauneux, Thaer, Thoun, Sigismondi, Jovellanos, Young, Marshal, Brown, Coventry, &c.*), that these men by their rigid adherence to precedent in the clauses of leases, have contributed most materially to retard the progress of agricultural improvement.

4280. *The land-surveyor* is another professional man, whom the superintendant of an estate may want to call in occasionally. Not merely to measure and map the whole or parts of the estate, but to assist in matters of arbitration, and the amicable settlement of disputes; or to act himself, as valuer or referee.

SECT. II. *Of the Land Steward's Place of Business, and what belongs to it.*

4281. *A manager's place of business* may be considered in regard to its situation, accommodation, and appropriate professional furniture.

4282. *The situation of the place of business* should be under the roof of the proprietor's principal residence; round which, and in its neighborhood, some considerable parts of his estates may be supposed (as they ever ought) to lie. If a large bulk of his property lie at too great a distance for tenants to attend at the principal office, and on which he has a secondary residence, an inferior office is there required for such detached part. And it may be laid down as a rule, in the management of landed property, Marshal observes, that every distant part of an estate ought to have a place upon it (be it ever so humble) in which its possessor may spend a few days comfortably; to diffuse over it a spirit of good order and emulation. He has known the most neglected and almost savage spot, such as are many landed estates in Ireland, reclaimed and put in a train of improvement by this easy method.

4283. *The accommodation* requisite for a principal office, are a commodious business room, a small anti-room; and a safe-keep, or strong room fire proof, for the more valuable documents.

4284. *The professional furniture* with which an office of this description requires to be supplied are maps, rental-books, books of valuation, register, legal papers, and some others.

4285. *A general map of the whole estate on a large scale* is an obvious requisite; and portable separate maps, with accompanying registers and other descriptive particulars, are useful in proportion as improvements may be in contemplation.

4286. *Books of valuation* are essential, especially where there are numerous small holdings on short terms. In these registers is contained the number, name, admeasurement, and estimated value of each field, and every parcel of land, as well as of each cottage, or other building, not being part of a farmstead, on the several distinct parts or districts of the estate. The valuations being inserted in columns, as they arise, whether by general surveys, or incidentally; headed with the names of their respective valuers, so that whenever a farm is to re-let, these columns may be consulted, and its real value be fixed, in a re-survey, with the greater exactness.

4287. *A general register of timber trees, copsewood, and young plantations* is particularly wanted where there is much hedge-row timber. Marshal directs to specify in this register the number of timber trees in each wood, grove, hedge-row, and area, with the species, number, and admeasurement of each tree. He also recommends separate pocket-books, containing the particulars of each division, or of a number of contiguous divisions, for the occasional use of the manager and wood-reeve.

4288. *Contracts, agreements, accounts, letters on business, and other documents*, should be intelligibly endorsed, dated or numbered, and arranged so as to be easily referred to. A book of abstracts, or heads of papers of greater importance, should be made out to be referred to on ordinary occasions, and likewise to serve as an index to the originals, which require a more secure repository than a common business-room.

4289. *Legal documents*, such as title deeds, legal decisions, awards of arbitration, counterparts of leases, securities, cash, bills, passed accounts, &c., as being the most important objects, should be carefully deposited in the safety-chest or strong room.

4290. *Portable registers of the tenanted lands in convenient pocket volumes*, with maps on a small scale heading every farm, are a most invaluable description of books both for the manager and his employer. Two opposite pages being appropriated to each farm with its map, the following information should be given:—

Name of the farm and its number of acres.
 The name of the tenant and the existing rent.
 The tenancy; if on lease, the term of expiring.
 Any extraordinary covenant of the lease.
 The number of cottages let with the farm.
 The number of timber trees growing on it.
 The number of orchard trees growing on it.

The eligibility of the plan and circumstances of the farm.
 The eligibility of the occupier.
 The eligibility of the present rent.
 The state of the buildings, fences and gates, roads, and watercourses.
 The state of cultivation, and condition of the live stock.

4291. *Add, among other things, the following, viz.*

The repairs more immediately wanted.
 The improvements of which the whole is susceptible.

The agreements entered into with the tenant.

The permissions granted him.

The injunctions delivered to him.

With a hint as to his personal character, and the number and general character of his family.

With any other incident or occurrence respecting the farm or its occupier, that requires to be remembered; and with references to the books and papers which may pertain to the several particulars; thus having at one view a complete abstract of the history and present state of every farm, together with the particulars of attention which each will require.

4292. *The trouble of forming an abstract of this kind, or of renewing it, when filled, or in order to adapt it to the varying circumstances of the several farms, is inconsiderable, compared with its uses; which are not only obvious to theory, but are fully established in practice.* On returning to an estate, after twelve months' absence, Marshal has generally found, that, by consulting a register of this sort, and, through its means, making systematic enquiries respecting the incidents that have occurred on the several farms during his absence; he, in this summary way, and before he entered upon a fresh view, became better acquainted not only with the general interests but with the more ordinary business, of the estate, than the acting manager, who had constantly resided upon it, without such a remembrancer. This abstract or remembrancer, he says, ought not to comprehend tenanted farms only; but should comprise woodlands, quarries, the demesne, &c., in hand; as well as the more important improvements going on: each of which ought to have its separate folio assigned it. To a proprietor, or his confidential friend, who only goes over his estate occasionally, such an intelligent companion is essentially serviceable. He cannot profitably direct, nor safely advise with, an acting manager, or other agent or officer of the estate, until he has consulted so infallible an oracle. The utility of such a register, while a proprietor is absent from his estate, if he can be said to be so, with such a faithful mirror in his possession, is too obvious to require explanation.

4293. *Among the instruments necessary for a manager's office, may be included those requisite for surveying, mapping, levelling, measuring timber, and every description of country work, together with boring machines, draught measurers, weighing scales, some chemical tests, models, and such other articles as may be required or rendered useful by particular circumstances.*

4294. *An agricultural library may be considered an essential requisite; including works on rural architecture, the prices and measuring of work, and other fluctuating matters; and one of the best Encyclopædia's of universal knowledge. We have already (4243.) suggested an important use to which such a library might be applied.*

4295. *Such an establishment and place of business as has been described, we agree with Marshal in thinking many will consider as in some degree superfluous or extravagant. In many cases we admit it would be so; but it is impossible to be determined what things can be done without, unless a particular case were given. Such a minute register of farms, for example, would be quite ridiculous on an estate in East Lothian, where tenants are of sufficient wealth and respectability of manners to be treated as men; and not watched and schooled like those which Marshal seems generally to have in view.*

CHAP. II.

Of the Duties of Managers of Estates.

4296. *The various duties of the manager, or the proprietor of a landed estate, may be considered under the heads of general business, business with tenants, and auditing accounts.*

SECT. I. *Of the general Principles of Business considered relatively to Land-Stewardship.*

4297. *The first and most general principle, in this and every other department of business, is to embrace readily the several matters as they occur: and not, on the contrary, to put them off from time to time, until they accumulate; and render the task of transacting them difficult and irksome. The only artifice, it may be said, which a man of character can well employ in business, is that of endeavouring to render it pleasurable. And, by meeting it cheerfully, as it rises, or as it becomes ripe for dispatch,*

this desirable end will generally be obtained. For, in that state a man not only enters upon it with pleasure himself, but he will generally find his opponent in the same temper of mind. Whereas through delay, misunderstandings, idle tales, and groundless surmises, are liable to intervene; the minds of both to be soured; a distant coolness to take place between them; and a barrier to be raised, which, though altogether imaginary, nothing but the mystic wand of the law may be able to remove.

4298. *There are three distinct methods of conducting business.* The first is that in which the parties meet, with fair intentions, to find out the point of equity, and there to close. In the second, they enter upon business, guarded with cunning, and armed with trick and artifice, as gamblers draw round a table, to take every advantage, fair or otherwise, which they can effect with impunity. The last method lies in the courts of law and equity.

4299. *A business founded on honorable intentions* is the only one in which a man of honor can voluntarily appear. Here honest men come as indifferent persons to arbitrate the matter in reference. In every settlement between man and man, there is a point of equity and right, which all good men are desirous to find; and when men of liberal minds fortunately meet and join in the search, it is seldom difficult to be discovered. Should some little difference of opinion arise, let them call in an unpartisan to decide between them; or leave the whole to the decision of three capable and disinterested men.

4300. *A man of strict integrity may become entangled in business with a man of looser principles.* In this case, it behoves him to be upon his guard; but still to enter into the negotiation with temper and civility. There is even a politeness in affairs of business which cannot be departed from on any occasion. Interruptions and schisms frequently arise, especially between men who are of keen sensibility, and who (though passably honest) are tenacious of their own interests, from mere matter of punctilio. The mind of either being once soured by neglect, or ruffled by disrespectful behaviour, the smooth path of peaceful negotiation is broken up, a spirit of warfare is roused, and advantages are taken, or attempted, which calm reason would not have suggested. Hence, when men of unequal degree are brought together in business, it is incumbent on the superior to set the example of liberality and civility of demeanor.

4301. *In extreme cases there is no resource but the law;* and here the most that an honest man can do is to procure, without loss of time, the best advice; and to spare no exertion or useful expense in bringing the dangerous and tormenting business to a speedy conclusion. Not only is a man's property endangered, while it is tossed on the troubled sea of the law; but his time and attention are led astray; and his peace of mind is liable to be broken in upon; thus deranging his ordinary concerns, and disturbing the stream of life. How much legal disputation might be prevented by a timely attention to business!

4302. *In forming connections in business, select the man who has a character to lose.* This principle should be invariably acted on. For if a man of established good character be properly treated, and determinately closed in with, in case he demur, or swerve from the right line of conduct, he will not forfeit his good name by doing a disreputable action; and must therefore come forward to the point of equity and justice.

SECT. II. *Of the Management of Tenants.*

4303. *The general treatment of tenants and cottagers* may be considered as the most important part of every land-steward's occupation: it includes the mode and conditions of letting lands; and the time and manner of receiving rents.

SUBSECT. 1. *Of the proper Treatment of Tenants.*

4304. *On every large hereditary estate, there are established customs and usages,* to which the proprietor and the occupiers consider themselves mutually amenable, though no legal contracts may subsist between them. Even where imperfect leases, or other legal agreements exist, still there is generally much left for custom and usage to determine. Though some of these may be improper, yet they ought to be strictly observed by its superintendant, until better can be placed in their stead; not merely on the score of moral justice, but, in the same observance, to set an example of integrity and good faith to the tenants. If a superintendant imprudently break through a custom or a covenant, what can he say to a tenant who follows his example?

4305. *A manager ought to set an example to the tenants* under his care, of liberality and kindness. This is more especially applicable to the case of cottagers and others who rent small holdings. There are numberless small favors which he can bestow upon them without loss, and many with eventual advantage to the estate. A spirited improving tenant should be refused nothing that he can reasonably ask — should have favors voluntarily conferred upon him; not merely as a reward for the services which he individually is rendering the estate, but to induce its other tenants to follow his

example, and to make known to the whole that their conduct is observed, and distinctions made between good and bad managers.

4306. *Estates, like men, have their good and bad characters.* No skilful farmer who has a capital to lose, will take up his residence on an estate of known bad character. On the contrary, when once an estate has acquired the character of good faith and proper treatment of its tenantry, men of money and spirit will ever be anxious there to gain a footing. Beside, the character of an estate will ever involve that of its possessor. And, setting income at nought, it surely behoves a man of property to pay some attention to the character of his estates. For what can well add more to the permanent respectability of a family of rank or fortune than having its estates occupied by a wealthy and respectable tenantry?

4307. *In a state of civilised society and property, one of the great arts of life is to teach character and interest to go hand in hand,* and on ordinary occasions to endeavor to turn every incident, as it fortuitously occurs, to their mutual advantage. If a tenant of capital and an improving spirit be found upon an estate, give him due encouragement, for the purposes already explained. On the contrary, if another is found to possess refractory habits, to swerve from his engagements, or to injure the lands in his occupation, it is but common prudence to take the first legal and fair opportunity of dismissing him, and supplying his place with another who is better qualified to fill it; not more with a view of rescuing his particular farm from further injury, and of making an example of him, in terror to others of similar habits, than to preserve and heighten the character of the estate.

4308. *These remarks may be considered as applicable chiefly to small tenants,* or such as from ignorance and want of leases may be considered as in a state of bondage. It ought never to be in the power of a landlord to make "an example of a tenant in terror to others;" it is enough if this power be left to the laws. A tenant who rents a farm on certain conditions, and fulfils them, is, in point of obligation, on an equality with his landlord; neither is obliged to the other: and while the one does not require those acts of kindness and liberality which Marshal inculcates, the other is not entitled to that submission and slavish deference so common among tenants at will, and indeed most others in England. It is justly observed by Brown (*Treat. on Rur. Aff.*), that the moral excitement, or degree of encouragement given to the tenant for improving the ground put under his occupation, is regulated entirely by the terms or conditions of the lease under which he holds possession. If the conditions be liberal and judicious, and accommodated to the soil and situation of the land thereby demised to the tenant, all that is obligatory upon the proprietor is faithfully discharged. But when matters are otherwise, when the tenant possesses under a short lease, when the covenants or obligations are severe in the first instance, and ultimately of little avail towards forwarding improvement; it may reasonably be inferred that the connection is improperly constituted, and that little benefit will thence follow either to the public or to the parties concerned.

SUBJECT. 2. *On the Business of letting Farms.*

4309. There are *three methods of letting a farm*: putting it up to public auction, and taking the highest bidder for a tenant: receiving written proposals, and accepting the highest offer, and asking more rent for it than it is worth: haggling with different chapmen, and closing with him who promises to give the most money, without regard to his eligibility as a tenant. After a variety of obvious remarks, Marshal concludes, that "seeing in every situation, there is at all times a fair rental value, or market price of lands, as of their products, there appears to be only one rational, and eventually profitable method of letting a farm; and this is to fix the rent, and choose the tenant. In the choice of a tenant every body knows the requisite qualifications to be, capital, skill, industry, and character. The respective advantages of these qualities are amply developed in *The Treatise on Landed Property*."

SUBJECT. 3. *Of the different Species of Tenancy.*

4310. *The different holdings* in use in Britain, are at will, from year to year, for a term of years, or for a life or lives.

4311. *The tenant holding at will*, or until the customary notice be given by either party to the other, is without any legal contract, or written agreement; the only tie between the owner and the occupier being the custom of the estate, or of the country in which it lies, and the common law of the land. This may be considered as the simple holding which succeeded the feudal or copyhold tenure; but which is now fast going into disuse.

4312. *Holding from year to year*, under a written agreement, with specified covenants, is a more modern usage, and becoming more and more prevalent in some parts of England, and among small tenants, even where leases for a term of years were formerly granted.

4313. *Leases for a term of years, as seven, fourteen, twenty-one, or a greater number of years, certain; but without the power of assignment, unless with the consent of the lessor.*

4314. *Leases for lives; as one, two, three, or more, without the power of assignment.* In Britain, life leases of this description are now rarely granted. In Wales and Ireland they are still prevalent; the rent being there settled according to the value of the land at the time of letting; as on granting a lease for a term. And in the western extreme of England, what are termed life-leases are still common. But they are rather pledges for money taken up, or deeds of sale for lives, than leases. For nearly the whole of the estimated sale value of the land, during the life term, is paid down at the time of purchase; the seller reserving only a quit rent, or annual acknowledgement.

4315. *A lease for a term of years, or for two or more lives, can alone be favorable for the progress of agriculture.* A farmer holding at will, or from year to year, may plough, sow, and reap; but he will, if a prudent man, be very careful not to make improvements, well knowing that the first effect would be, a rise of rent or a notice to quit. Leases for a single life have the great disadvantage of uncertainty as to duration, both as landlord and tenant; and though the latter may insure a certain sum on his life for the benefit of his family, yet it were better that he should lay out that money in improving the farm. Leases on lives, renewable, are for all purposes of culture as good as freehold; but they have this disadvantage to a tenant, that they require a considerable part of his capital paid down, and a further draught on his capital on the falling in of any of the lives. Even the first of these payments would embarrass the great majority of professional farmers, and disable them from bestowing proper cultivation on the soil; but to a farmer with a surplus capital no description of lease can be better, as he lays out his surplus capital at the market rate of interest, and is, as it were, his own annuitant. To the landlord such leases cannot be advantageous, because, there being fewer who can compete for them, lands let on these conditions, do not fetch their full price.

4316. *The fundamental principle from which both the duration and conditions of leases are established is evidently this:* A. agrees to lend to B. a certain article for his use for an equivalent in money; but such is the nature of this article, that in order to use it with advantage, B. must possess it during a considerable time; he, therefore, requires a security from A. to that effect; and A. on his part requires a security from B. that he will return the article at least in as good condition as when it was lent to him. The term of years for which the article is to be lent, and the precautions taken to ensure its return without deterioration, are founded on experience, and vary according to the peculiar circumstances of lender and borrower. In general, however, this is obvious, that where the period of lending is not sufficient for profitable use; or the conditions required for ensuring the lender an undeteriorated return of the article unreasonable, the value of the loan or rent will be proportionably diminished. (*Sup. Enc. Brit. art. Agr.*)

4317. *In recurring to what actually exists in the best cultivated districts, we shall quote the excellent observations of an experienced farmer and approved public writer.* "The general principle which should regulate the connection between landlord and tenant seems to be, that while the farm ought to be restored to the owner at the expiration of the tenant's interest, at least without deterioration, the tenant should be encouraged to render it as productive as possible during his possession. In both of these views, a lease for a term of years is scarcely less necessary for the landlord than for the tenant; and so much is the public interested in this measure, that it has been proposed by intelligent men, to impose a penal tax on the rent of lands held by tenants at will.

4318. *That the value of the property is enhanced by the security which such a lease confers on the tenant,* will be put beyond all doubt, if the rents of two estates for half a century back are compared; the one occupied by tenants at will, and the other by tenants on leases for a moderate term, and where the soil and situation are nearly alike in every respect. If the comparison be made between two tracts, originally very different in point of value, the advantages of leases will be still more striking; while that which is held by tenants at will remains nearly stationary, the other is gradually, yet effectually, improved, under the security of leases, by the tenants' capital; and, in no long period, the latter takes the lead of the former, both in the amount of the revenue which it yields to the proprietor, and in the quantity of produce which it furnishes for the general consumption. The higher rents and greater produce of some parts of Scotland than of many of the English counties, where the soil, climate, and markets are much more favorable, must be ascribed to the almost universal practice of holding on leases in the former country, in a much greater degree than to any of the causes which have been frequently assigned. Less than a century ago, what are now the best cultivated districts of Scotland were very far behind the greater part of England; and, indeed, had made very little progress from the time of the feudal system. It is not fifty years since the farmers of Scotland were in the practice of going to learn of their southern neighbors an art, which was then very imperfectly known in their own country. But in several parts of England there has been

little or no improvement since, while the southern counties of Scotland have uniformly advanced; and at present exhibit very generally, a happy contrast to their condition in the middle of the last century.

4319. *In respect to farmers themselves*, it cannot be necessary to point out the advantages of leases. It may be true, that, under the security of the honor of an English landlord, tenants at will have been continued in possession from generation to generation, and acquired wealth which he has never, like the landholders of some other countries, attempted to wrest from them. But there are few individuals in any rank of life, who continue for a length of time to sacrifice their just claims on the altar of pure generosity. Something is almost always expected in return. A portion of revenue in this case is exchanged for power, and that power is displayed not only in the habitual degradation of the tenantry, but in the control over them, which the landlord never fails to exert at the election of members of parliament, and on all other political emergencies. No prudent man will ever invest his fortune in the improvement of another person's property, unless, from the length of his lease, he has a reasonable prospect of being reimbursed with profit; and the servility which holding at will necessarily exacts, is altogether incompatible with that spirit of enterprise which belongs to an enlightened and independent mind.

4320. *Every measure which has a tendency to fetter the productive powers of the soil*, must deeply affect the public at large, as well as depress one of the largest and most valuable classes. It is clearly their interest, that corn and other provisions should be supplied in abundance, and the people of England may justly complain of the want of leases, as one of the principal causes which checks the improvement of their own territory.

4321. *What ought to be the term of a lease*, can only be determined by a reference to the circumstances of each particular case. Lands naturally rich, or such as have already been brought to a high degree of fertility, requiring no great investment of capital, and returning all or nearly all the necessary outlay within the year, may be advantageously held upon short leases, such as perhaps give time for two, or at most three, of the rotations or courses of crops to which the quality of the soil is best adapted. The practice of England in this respect is extremely various, almost every term, from twenty years downwards, being found in different parts of it. In Scotland, by far the most common period is nineteen years, to which it was formerly the practice, in some places, to add the life of the tenant. In that country, even when it is thought expedient to agree for a much longer term, this is still expressed in periods of nineteen years, a sort of mysterious cycle, which seems to be no less a favorite with the courts of law, than with landholders and farmers. Yet this term is somewhat inconvenient, as it can never correspond with any number of the recognised rotations of arable land.

4322. *A lease for twenty years*, it has been maintained by several writers, is not sufficient to reimburse a tenant for any considerable improvements, and landholders have often been urged to agree to a much longer term, which, it is alleged, would be not less for their own interest than for that of the tenant. This is a question which our limits do not permit us to discuss, but, after viewing it in different lights, assisted by the experience of long leases in different parts of Scotland, we cannot help expressing some doubts of their utility, even in so far only as regards the parties themselves; and we are decidedly of opinion, that a greater produce will be brought to market, from any given extent of land held on successive leases of twenty years, for half a century, than if held on one lease of that duration, whether the term be specified or indefinite, as is the case of a lease for life. As a general mode of tenure, leases for lives seem to us particularly objectionable.

4323. *The great advantages of a lease* are so well known in Scotland, that one of her best agricultural writers, himself a landed proprietor, has suggested a method of conferring on it the character of perpetuity, to such an extent as, he thinks, would give ample security to the tenant for every profitable improvement, without preventing the landlord from resuming possession upon equitable terms, at the expiration of every specified period. But the author of this plan (Lord Kaim), in his ardent wishes for the advancement of agriculture, at that time in a very backward state in his native country, seems to have overlooked the difficulties that stood in the way of its adoption; and the great advance in the price of produce, and consequently in the rate of rents, since his lordship wrote, have long since put an end to the discussion which his proposal excited. For a form of a lease on his plan, the reader may consult Bell's *Treatise on Leases*; and the objections to the plan itself are shortly stated in the supplement to the sixth edition of *The Gentleman Farmer*, recently published.

4324. *Long leases granted upon condition of receiving an advance of rent at the end of a certain number of years* have been granted; but covenants of this kind, meant to apply to the circumstances of a distant period, cannot possibly be framed in such a manner as to do equal justice to both parties; and it ought not to be concealed, that, in every case of a very long lease, the chances are rather more unfavorable to the landlord than to the

farmer. If the price of produce shall continue to rise as it has done, till very lately, for the last forty years, no improvements which a tenant can be expected to execute will compensate the landlord's loss; and if, on the other hand, prices shall decline, the capital of most tenants must be exhausted in a few years, and the lands will necessarily revert to the proprietor, as has been the case of late in many instances. Hence a landholder, in agreeing to a long lease, can hardly ever assure himself, that the obligations on the part of the tenant will be fully discharged throughout its whole term, while the obligations he incurs himself may always be easily enforced. He runs the risk of great loss from a depreciation of money, but can look forward to very little benefit from a depreciation of produce, except for a few years at most. Of this advantage a generous man would seldom avail himself; and, indeed, in most instances, the advantage must be only imaginary, for it would be overbalanced by the deterioration of his property." (*Sup. Encyc. Brit. art. Agr.*)

4325. There are various objections made to leases of nineteen or twenty-one years. Some of these are of a feudal and aristocratical nature; such as the independence it gives the tenants who may become purse-proud and saucy under the nose of their landlord, &c. A greater objection has arisen from the depreciation of British currency during the last ten years of the eighteenth, and first ten of the nineteenth centuries. Various schemes have been suggested to counteract this evil; but the whole of them are liable to objections, and it may be safely stated, that it admits of no remedy, but the generous interference of the landlord.

SUBJECT. 4. *Of the Rent and Covenants of a Lease.*

4326. To avert the evils of fixed money rents, and long leases, both to landlords and tenants, the best mode known at present is the old plan of corn rents. This plan was first revived in 1811, by a pamphlet published in Cupar, which attracted considerable attention, and has led to the adoption in various parts of Scotland, of a mixed mode of paying rents, partly in corn or the price of corn, and partly in money. In hilly districts, instead of corn, wool, or the price of wool for an average of years, is sometimes fixed on. We shall quote from the same intelligent writer, on the duration of leases, his sentiments on corn rents, and subjoin his observations on covenants.

4327. Though the most equitable mode of determining the rent of lands on lease, would be to make it rise and fall with the price of corn; yet, "a rent paid in corn is liable to serious objections, and can seldom be advisable in a commercial country. It necessarily bears hardest on a tenant when he is least able to discharge it. In very bad seasons, his crop may be so scanty, as scarcely to return seed and the expenses of cultivation, and the share which he ought to receive himself, as the profits of his capital, as well as the quantity allotted to the landlord, may not exist at all. Though, in this case, if he pays a money rent, his loss may be considerable, it may be twice or three times greater if the rent is to be paid in corn, or according to the high price of such seasons." In less favorable years, which often occur in the variable climate of Britain, a corn rent would, in numerous instances, absorb nearly the whole free or disposable produce, as it is by no means uncommon to find the gross produce of even good land reduced from twenty to fifty per cent. below an average, in particular seasons. And it ought to be considered, in regard to the landlord himself, that his income would thus be doubled or trebled, at a time when all other classes were suffering from scarcity and consequent dearth; while, in times of plenty and cheapness, he might find it difficult to make his expenses correspond with the great diminution of his receipts. It is of much importance to both parties, that the amount of the rent should vary as little as possible from any unforeseen causes, though tenants in general would be perhaps the most injured by such fluctuations.

4328. To obviate these and other objections to a corn rent, and to do equal justice at all times to both landlord and tenant, a plan has been lately suggested for converting the corn into money, adopting for its price, not the price of the year for which the rent is payable, but the average price of a certain number of years. The rent, according to this plan, may be calculated every year, by omitting the first year of the series, and adding a new one; or, it may continue the same for a certain number of years, and then be fixed according to a new average. Let us suppose the lease to be for twenty-one years, the average agreed on being seven years, and the first year's rent, that is, the price of so many quarters of corn, will be calculated from the average price of the crop of that year, and of the six years preceding. If it be meant to take a new average for the second and every succeeding year's rent, all that is necessary is, to strike off the first of these seven years, adding the year for which the rent is payable, and so on during all the years of the lease. But this labor, slight as it is, may be dispensed with, by continuing the rent without variation for the first seven years of the lease according to the average price of the seven years immediately preceding its commencement, and, at the end of this period, fixing a new rent, according to the average price of the seven years just expired, to continue for the next seven years. Thus, in the course of twenty-one years, the rent would be calculated only

three times; and for whatever quantity of corn the parties had agreed, the money payments would be equal to the average price of fourteen years of the lease itself, and of the seven years preceding it; and the price of the last seven years of the old lease, would determine the rent during the first seven years of the new one.

4329. *The landlord and tenant could not suffer*, it has been thought, either from bad seasons or any change in the value of the currency, should such a lease as this be extended to several periods of twenty-one years. The quantity of corn to be taken as rent, is the only point that would require to be settled at the commencement of each of those periods; and though this would no doubt be greater or less, according to the state of the lands at the time, yet it may be expected, that in the twenty-one years preceding, all the tenant's judicious expenditure had been fully replaced. Instead of the twofold difficulty in fixing a rent for a long lease, arising from uncertainty as to the quantity of produce, which must depend on the state of improvement, and still more perhaps from the variations in the price of that produce, the latter objection is entirely removed by this plan; and in all cases where land is already brought to a high degree of fertility, the question about the quantity of produce may likewise be dispensed with.

4330. *If the corn rent plan be applied to leases of nineteen or twenty-one years*, the inconvenience resulting from uncertainty as to the amount of rent, as well as other difficulties which must necessarily attend it, would be as great perhaps as any advantages which it holds out to either of the parties. If it be said that a rent, determined by a seven year's average, could not suddenly nor materially alter, this is at once to admit the inutility of the contrivance. The first thing which must strike every practical man is, that corn is not the only produce of a farm, and in most parts of Britain, perhaps not the principal source from which rent is paid; and there is no authentic record of the prices of butcher meat, wool, cheese, butter, and other articles in every county to refer to, as there is of corn. This is not the place to inquire whether the price of corn regulates the price of all the other products of land, in a country whose statute books are full of duties, bounties, drawbacks, &c. to say nothing of its internal regulations; but it is sufficiently evident, that if corn does possess this power, its price operates too slowly on that of other products to serve as a just criterion for determining rent on a lease of this duration. Besides, in the progress of agriculture, new species or varieties of the *cerealia* themselves are established even in so short a period as twenty-one years, the prices of which may be very different from that of the corn specified in the lease. What security for a full rent, for instance, would it give to a landlord, to make the rent payable according to the price of barley, when the tenant might find it more for his interest to cultivate some of the varieties of summer wheat, lately brought from the continent? or, according to the price of a particular variety of oats, when, within a few years, we have seen all the old varieties superseded throughout extensive districts, by the introduction of a new one, the potatoe-oat, which may not be more permanent than those that preceded it? There can be no impropriety, indeed, in adopting this plan, for ascertaining the rent of land kept always in tillage; but it would be idle to expect any important benefits from it, during such a lease as we have mentioned.

4331. *The corn rent plan, in the case of much longer leases*, will no doubt diminish the evils which we think are inseparable from them, but it cannot possibly reach some of the most considerable. Its utmost effect is to secure to the landholder a rent which shall in all time to come be an adequate rent, according to the state of the lands and the mode of cultivation known at the date of the lease. But it can make no provision that will apply to the enlargement of the gross produce from the future improvement of the lands themselves, or of the disposable produce from the invention of machinery and other plans for encouraging labor. And the objections just stated, in reference to a lease of twenty-one years, evidently apply much more forcibly to one of two or three times that length. Old corn-rents, though much higher at present than old money-rents, are seldom or never so high as the rents could now be paid on a lease of twenty-one years. But, independent of these considerations, which more immediately bear upon the interests of the parties themselves, one insuperable objection to all such leases is, that they partake too much of the nature of entails, and depart too far from that commercial character which is most favorable to the investment of capital, and consequently to the greatest increase of land produce.

4332. *A lease for a term of years is not, in all cases, a sufficient encouragement to spirited cultivation*; its covenants in respect to the management of the lands may be injudicious; the tenant may be so strictly confined to a particular mode of culture, or a particular course of crops, as not to be able to avail himself of the beneficial discoveries which a progressive state of agriculture never fails to introduce. Or, on the other hand, though this is much more rare, the tenant may be left so entirely at liberty, that either the necessity of his circumstances, during the currency of the lease, or his interest towards its expiration, may lead him to exhaust the soil, instead of rendering it more productive. When a lease therefore is either redundant or deficient in this respect; where it either permits the lands to

be deteriorated or prevents their improvement; the connection between landlord and tenant is formed upon other views, and regulated by some other principle, than the general one on which we think it should be founded.

4333. *Restrictive covenants are always necessary to the security of the landlord, notwithstanding the high authority of Dr. Smith to the contrary, and in some cases beneficial to the tenant.* Their expediency cannot well be questioned in those parts of the country where an improved system of agriculture has made little progress. A landholder, assisted by the advice of experienced men in framing these covenants, cannot adopt any easy or less offensive plan for the improvement of his property, and the ultimate advantages of his tenantry. Even in the best cultivated districts, while farms continue to be let to the highest responsible offerers, a few restrictive covenants cannot be dispensed with. The supposed interest of the tenant is too feeble a security for correct management, even during the earlier part of a lease, and in the latter part of it, it is thought to be his interest, in most cases, to exhaust the soil as much as possible, not only for the sake of immediate profit, but frequently in order to deter competitors, and thus to obtain a renewal of his lease at a rent somewhat less than the lands would otherwise bring.

4334. *With tenants at will, and such as hold on short leases, restrictive covenants are more necessary than with tenants on leases of nineteen or twenty years; but in many instances, they are too numerous and complicated, and sometimes even inconsistent with the best courses of modern husbandry.* The great error lies, in prescribing rules by which a tenant is positively required to act, not in prohibiting such practices and such crops as experience has not sanctioned. The improved knowledge, and the liberality of the age, have now expunged the most objectionable of these covenants; and throughout whole counties, almost the only restriction in reference to the course of crops is, that the tenant shall not take two culmiferous crops, ripening their seeds in close succession. This single stipulation, combined with the obligation to consume the straw upon the farm, and to apply to it all the manure made from its produce, is sufficient not only to protect the land from exhaustion, but to ensure in a great measure its regular cultivation; for half the farm at least must, in this case, be always under either fallow or green crops. The only other necessary covenant, when the soil is naturally too weak for carrying annual crops without intermission, is, that a certain portion of the land shall be always in grass, not to be cut for hay but depastured. According to the extent of this will be the interval between the succession of corn crops on the same fields; if it is agreed that half the farm, for instance, shall always be under grass, there can be only two crops of corn from the same field in six years. In this case not more than two-sixths being in corn, one-sixth in green crops or fallow, and three-sixths in clover or grasses, it becomes almost impossible to exhaust any soil at all fitted for tillage. There are few indeed that do not gradually become more fertile under this course of cropping. It is sufficiently evident, that other covenants are necessary in particular circumstances; such as permission to dispose of straw, hay, and other crops from which manure is made, when a quantity of manure equal to what they would have furnished is got from other places; and a prohibition against converting rich old grazing lands or meadows into corn lands. In this place we speak only of general rules, such as are applicable to perhaps nine-tenths of all the arable land of Britain, and such as are actually observed in our best cultivated counties.

4335. *For the last four years of a lease, the same covenants are generally sufficient, only they require to be applied with more precision.* Instead of taking for granted, that the proportion of the farm that cannot be under corn will be properly cultivated, from the tenant's regard to his own interest, it becomes necessary to make him bound to this effect in express terms; the object generally being to enable the tenant, upon a new lease, to carry on the cultivation of the lands, as if the former lease had not terminated. What these additional stipulations should be, must depend in part on the season of the year at which the new lease commences, and in part on the course of crops best adapted to the soil, and the particular circumstances of every farm.

4336. *With respect to the form of a lease, as no one form would suit every district, nothing specific can be laid down with advantage.* The lawyers of every estate have particular forms, and it is easy for them, in concert with the proprietor or manager, to obliterate useless or injurious restrictions, and substitute such as may be deemed best for the estate, or in harmony with the progress of the age." (*Sup. Encyc. Brit. art. Agr.*)

SUBJECT. 5. *Of receiving Rents.*

4337. *The business of receiving the rents and profits of a landed estate, simple as it may seem, is subject to analysis, and entitled to consideration.* Indeed, on large properties, on which not farm rents only, but various other profits are to be received; as cottage rents, tithe compositions, chief rents, and perhaps, quit rents of copyhold lands; the business becomes so complex as to require to be methodised and simplified, in order to obtain the requisite facility and dispatch. This is generally best effected by appointing distinct days, or distinct parts of the day, for each receipt, so that the different tenants and suitors may know their hours of attendance.

4338. *The business of holding manor courts depends on whether they are held of right, or merely by custom.* If the copyhold tenure is so far worn out in any manor, that there are not two ancient or feudal tenants remaining within it, the court has lost its legal power; it cannot by right, take cognizance of crimes, nor enforce amercedments. Nevertheless, manorial courts have their uses, in regulating farm roads, driftways, and watercourses, and in preventing nuisances of different kinds within a manor; and it is generally right to preserve the custom of holding them for these purposes.

4339. *Where copyhold courts remain in force, and where legal forms are to be observed, a law "steward of the manor" is proper to hold them.* It is not necessary, however,

that courts of this kind should interfere with the receipt of farm rents ; or that a business of this nature should in any way clash with the general receivership of the estate. Employ an attorney to hold courts, as a surveyor to arbitrate disputes, or an engineer to plan works of improvement.

4340. *The propriety of having fixed days for receiving the rents of farms* is evident, and some consideration is required to determine on the season of the year for holding them, so as not to oblige the farmer to forced sales of his produce. In England and Ireland, farm rents are generally due at Ladyday and Michaelmas, and in Scotland at Candlemas and Lammas. But the proper times of paying them depend on the marketable produce of an estate, and on the season of the year at which it goes in common course, and with the best advantage to market. A tenant should never be forced to sell his produce with disadvantage ; nor when he has received his money for it, ought he to be at a loss for an opportunity of discharging his debt to his landlord. On corn-farm estates, or those whose lands are kept in a state of mixed cultivation, which comprise the great mass of farm lands in this kingdom, Michaelmas may be considered as one of the worst times of the year, at which to call upon tenants for their rents. It is at the close (or, in the northern provinces, perhaps at the height) of harvest, when the farmers' pockets are drained by extra labor, and when they have not yet had time to thresh out their crops to replenish them ; nor is the summer's grass at that season yet consumed, nor off-going stock, perhaps, yet ready for market. In Norfolk, Marshal found the end of February or beginning of March, a very fit time to pay the half year's rent due at Michaelmas ; and June for paying those due at Ladyday. In some districts of the north it used to be the custom not to demand the first half year's rent, till the tenant was a year in his farm, by which means he had the use during his lease of nearly a year's rent in addition to his actual capital. But farmers there, being now considered as possessed of more wealth than formerly, the first half year's rent of the lease is paid nine months after possession, and the last half year's rent of the term on or immediately before its expiry.

4341. *The proper days for receiving rents* are to be sought for in the local circumstances of an estate, and the district in which it lies : most especially in the fairs of the neighborhood at that season ; and in other stated times, at which the tenants are accustomed, in conformity with the practice of the country, to receive for their dairy produce, or other articles, delivered in to dealers ; fixing the rent days, immediately after these days of imbursement.

4342. *On the subject of arrears*, a good deal has been said by Marshal ; but it is one of those which may very safely be left to the good sense and discretion of the proprietor or his manager.

SECT. III. *Of Keeping and Auditing Accounts.*

4343. *Clearness and brevity* constitute the excellence of accounts, and these excellencies are only to be obtained by simplicity of method. Where lands lie in detached estates so as to require different receivers, a separate account is necessarily required for each receivership ; but to preserve this simplicity and clearness, it is necessary that the several sets should be precisely in the same form.

4344. *The ground-work of the accounts peculiar to a landed estate*, is the rent-roll : from this receiving rentals are to be taken, and with these and the miscellaneous receipts and disbursements incident to the estate, an account current is to be annually made out.

4345. *The receiving rental*, or particulars which a receiver wants to see, at one view, when receiving the rents of an estate under judicious management, — where rents are regularly received, — and where occupiers pay taxes and do ordinary repairs, — are few : the name of the farm, the name of the tenant, and the amount of his half year's rent, only are required. But upon an estate, on which arrears are suffered to remain, and on which matters of account are liable to take place, a greater number of particulars are necessary ; as the name of the farm, of the tenant, his arrears, his half year's rent, any other charge against him, any allowance to be made him, and the neat sum receivable, leaving a blank for the sum received and another for the arrear left.

4346. *Accounts current* are required to be delivered in annually by the acting manager, who ought generally to be the receiver. If the current receipts and disbursements are numerous, as where extensive improvements are going on, and woods, mines, quarries, &c. in hand, such accounts may be given in monthly which will show the progress of the several concerns, and simplify the business at the end of the year.

4347. *On the best managed estates* it is usual, besides the books which have been mentioned, to keep a ledger ; opening separate accounts for farm lands, woods, mines, quarries, waters, houses and their appurtenances, public works, &c. : and where a proprietor has several detached estates, besides such accounts being kept on each, one master ledger contains accounts for each property. This, indeed, is nothing but an obvious

application of mercantile book-keeping to territorial property, the advantages of which cannot but be as great in the one case as in the other.

4348. *In auditing estate accounts*, the rent accounts are to be checked with the arrears of the preceding year; the column of rents with the rent-roll, corrected up to the last term of entry in order to comprise the fresh lettings, and the columns of account with the particulars; those of allowances being signed by the respective tenants.

4349. *The monthly accounts of receipts and disbursements*, as well as the annual payments, are to be compared with vouchers. The receipts are checked by deeds of sale, contracts, and other written agreements, the awards of referees, or the estimates of surveyors, the market prices of produce, &c. &c.; the receiver, in every case, identifying the person, from whom each sum was received. Each disbursement requires a direct and sufficient voucher, endorsed and numbered; with a corresponding number affixed to the charge in the account; so that they may be readily compared.

4350. *The most essential part of the office of an auditor* is that of entering into the merits of each receipt and payment; and considering whether the charges correspond with the purposes for which they are made; and whether the several sums received are adequate to the respective matters disposed of; by these means detecting, and thenceforward preventing, imposition and connivance. This, however, is an office which no one but a proprietor, or other person who has been conversant with the transactions that have taken place upon the estate, and who has a competent knowledge of rural concerns, can properly perform. It may therefore be right to repeat, that if a proprietor has not yet acquired a competent knowledge of his own territorial concerns, to form an adequate judgment of the different entries in his manager's account, let him call in the assistance of those who are conversant in rural affairs, to enable him to judge of any particular parts that may seem to require it; and not set his hand to an account which he does not clearly understand; nor authorize another to sign it, who may have less knowledge than he has of its merits.

BOOK V.

OF THE SELECTION, HIRING, AND STOCKING OF FARMS.

4351. *Farms or lands let out to men who cultivate it as a business or profession*, exist in all highly civilised countries. Sometimes the farmer or tenant pays to the proprietor or landlord a proportion of the produce, determined yearly, or as the crops ripen; and sometimes he pays a fixed quantity of produce, or labor, or money, or part of each of these. In Britain, where farming, as a profession, is carried to a higher degree of perfection than in any other country, the connection between landlord and tenant is regularly defined by particular agreements and general laws; and the latter, on entering on a farm, engages to pay a fixed sum for its use for a certain number of years. This sum is fixed according to the estimated value of the land; but being fixed, and for a certain time, it admits of no abatement in proportion to the quantity or value of the produce, as in the proportional or metayer system, general in most countries (265. and 585.); and hence the necessity of a farmer maturely considering every circumstance connected with a farm before he becomes its tenant. The subjects of consideration form the business of this Book, and naturally divide themselves into such as relate to the farm; to the farmer; and to the landlord.

CHAP. I.

Of the Circumstances of a Farm necessary to be considered by a proposed Tenant.

4352. *Whoever intends to become a professional, or rent-paying farmer*, will, in searching for a farm, find it necessary to attend to a great variety of considerations. Those of the greatest importance may be included under climate, soil and subsoil, character of surface, topographical position, extent, buildings, roads, fields, tenure, rent, and outgoings. In *The Code of Agriculture*, a more valuable collection of facts as to these points is brought together than in any other work, and from it, therefore, we shall select the greater part of the following sections.

SECT. I. *Of Climate in respect to farming Lands.*

4353. *The climate of a farm* is one of the circumstances over which human art has less control than any other; and a farmer who has but a temporary interest in his possession may be considered as incapable of exercising any influence over it. He may improve the soil and subsoil by draining and culture; and the buildings, roads, and fences by additions and alterations; but it is for the landlord to attempt improving the climate by planting, and for a future generation to enjoy the effects.

4354. *Sufficient attention*, it is said in *The Code of Agriculture*, "is rarely paid by the farmer to the nature of the climate in which his operations are carried on. Unless the system he adopts be calculated for the weather his crops are likely to experience, every exertion will often terminate in disappointment. The system that is proper for warm and dry situations, is not suitable for cold and wet ones; and in a bleak and backward climate, the nature of the soil ought not only to be attended to, but the utmost care ought to be paid to the early sowing of the earliest varieties of seed. Even the species of stock to be bred, or kept on a farm, should in a great measure be regulated by the climate. Hence, this is a subject which the diligent farmer will invariably study with the greatest solicitude. Climate and soil, Curwen justly remarks, are, above all other considerations, those which the farmer ought constantly to keep in view." (*Report to the Worthington Society.*)

4355. *In considering the climate of a country*, the following points are of peculiar importance: its general character, and the means of its improvement; its local heat; the light it furnishes; the quantity of its moisture; the prevailing winds; its position, whether maritime or inland; the regularity of the seasons; the phenomena to which it is liable; the productions best suited to it; the expenses it may occasion in cultivation; and its suitableness for the introduction of exotic plants, and animals from other climates.

4356. *The general character of a climate* not only depends on position or latitude, but likewise on the elevation of a country above the level of the sea; its general aspect; the vicinity to mountains, forests, bogs, marshes, lakes, and seas; the nature of the soil and subsoil, and the power which the former possesses of retaining heat and moisture; the direction of the winds; the length of time the sun continues above the horizon; the difference of temperature between the day and the night; and the extent of dry surface in the neighborhood. The result of these particulars combined, form, what may be called, the general character of climate. Some of the causes of an unfavorable climate cannot be remedied by any human effort; in other cases art may effect much; but that art is generally such as the farmer can seldom undertake unless with a very long lease. Ameliorations of this sort, therefore, belong to the landlord.

4357. *The importance of heat*, as a stimulus to vegetation, cannot be doubted. It is at a certain degree of heat that vegetation commences, and it becomes nearly stationary when the temperature falls below it. There are, comparatively speaking, but few plants calculated for very cold countries, and these are seldom valuable; whereas in warm and temperate regions, the variety is great, and their value unquestionable. Indeed, such is the effect of cold, that while the thermometer is below 40° of heat, the strongest plants become torpid, and remain in that state while it continues. Revived by the warmth of spring, and strengthened by the heat of summer, they acquire fresh life and vigor, and are thus better enabled to withstand the rigors of the succeeding winter.

4358. *An increased temperature, when not carried to excess, will augment the quantity of nutritive matter in a plant*, or improve the quality of fruit grown under its influence. Thus English barley, of equal weight, is more valuable than the Scotch, because, from growing in a warmer climate, and enjoying the advantage of a greater quantity of heat and light, it is more fully ripened. It thence acquires more saccharine matter, and produces a greater quantity of spirits, or of malt liquor. It is also proved, by the experiments of Sir Humphry Davy, that wheat ripened in a more regular and warmer climate, contains more of that valuable article called gluten, than the same species of grain when raised in England.

4359. *The average heat of the year* is not, however, of so much importance to the growth of plants, as its duration, and its steadiness at a certain degree, during the season when the grain is ripening. This gives the uniform climates of the continent a great advantage over our variable seasons, in the production of the more delicate sorts of fruit; which, in this island, are often injured by the frosts in spring, and seldom ripen in a northern climate, where the greatest summer heat is both unsteady and of short duration.

4360. *The quantity of solar light* which a climate furnishes, is likewise an important object of inquiry. Light is essential to increase the proportion of starch or farina; to complete the formation of oils in plants; and to give to fruits their proper color and flavor. It has also the effect of augmenting saccharine matter, inasmuch that those

sugar-canes which are exposed to the sun, have more of that important ingredient than when they grow under shade. Nor ought the observation to be omitted, that darkness and light have effects directly opposite upon vegetables. Darkness favors the length of the growth, by keeping up the pliancy of their parts; light consolidates them, and stops growth, by favoring maturation. Hence, in the northernmost regions, plants go through all their stages of growth at a time when the sun no longer quits the horizon; and the light, of which they thus experience the unremitting effect, hardens them before they have time to lengthen. Their growth is therefore quick, but of short duration. They are robust, but undersized. (*Mirbel.*) It has been remarked also, that a soil, not retentive, will be more productive in a wet climate than in a dry one. Hence, in the western coasts of England, as in Lancashire, where the quantity of rain that falls annually varies from forty to sixty inches, a siliceous sandy soil is much more productive than the same species of soil in the eastern districts, where seldom more than from twenty-five to thirty-five inches of rain fall in a year. In wet climates also, even wheat and beans will require a less coherent and absorbent soil than in drier situations. At the same time, weather moderately dry, is the most favorable to a great produce of corn; and the blossoms of wheat, in particular, set best if no rain falls in the flowering season.

4361. *The importance of moisture to vegetation is obvious to every one.* Water constitutes a large proportion of every plant, and is the vehicle of the food of plants held in solution. Hence, without so essential an ingredient, they must either become stunted in their growth, or perish. In dry weather, when vegetation seems at a stand, no sooner do showers of rain fall, than a rapid growth, of every kind of herbage, or of corn, immediately succeeds, even on poor dry soils, where otherwise, however well manured, vegetation would make but slow progress.

4362. *The quantity of rain that falls annually in any country, is a very inferior consideration, when compared with that of the general and equable distribution of that quantity throughout the several days and months of the year.* A great quantity, at the same time, is rather hurtful than beneficial; whereas those moderate, but *golden showers*, which regularly fall on a soil calculated to receive them, are real sources of fertility. It is by this that the character of a climate, whether wet or dry, is chiefly determined, and the operations of agriculture are principally influenced.

4363. *The utility of a moist atmosphere, with a view to vegetation, is, in some respects, peculiarly remarkable.* Thus in wet climates, as on the western coasts of England, Scotland, and Ireland, crops of grain and potatoes are found to exhaust the soil less than in dry situations. Oats in particular are impoverishing in a greater degree in dry climates, than in moist ones; and in the former, should be sown much earlier than in the latter.

4364. *The disadvantages of a wet climate to a farmer, more especially if accompanied with a retentive soil, are very great.* It is calculated, that in the richest district in Scotland, the Carse of Gowrie, there are only about twenty weeks in the year fit for ploughing; whereas in several parts of England, they have thirty weeks, and in many cases more, during which this essential operation can be performed. Hence ploughing must be much more expensive in the one case than in the other.

4365. *The season of the year in which rain abounds, is likewise of much importance.* An excess is prejudicial in any season, but is peculiarly so in autumn, when it often lodges the grain by its violence, or, by its long continuance, prevents the corn from being properly harvested. The hopes of the husbandman are thus blasted, and the fruits of his toil and industry are frequently diminished, and sometimes entirely lost.

4366. *Dews have a great effect in furnishing plants with moisture; and, indeed, without their aid, vegetation, in warm and dry climates, could not go on.* Even in temperate regions, dews are beneficial. In Guernsey, on the coast of Normandy, the autumnal dews are singularly heavy, so much so, that in the middle of a hot day, the dew-drops are not quite exhaled from the grass. From this moisture, the after-grass receives great benefit. Dr. Hales estimated the quantity of dew that falls in one year, at three and a half inches: Dalton at nearly five inches. In this matter, however, it is not easy to be correct.

4367. *The prevailing winds have a great influence on the character of a climate, and a powerful effect on vegetation.* When they pass over a large expanse of water, they are usually of a warmer or higher temperature in winter, than those which blow over high lands; more especially if such come from countries covered with snow. Hence the east and north-east winds, which have passed over the coldest regions of Europe, are much colder than the west and south-west winds, which blow over the Atlantic Ocean, and oftener occasions blights. The former are comparatively drier, unless when accompanied by those thick mists, called *haars*, arising from the copious evaporation of the German Ocean. The latter are loaded with the vapors of the Atlantic, and often, from excess of moisture, are rendered prejudicial. The strength of the prevailing winds, or the

violence with which they act, more especially during harvest, ought likewise to be considered. If they are very violent, they are apt to affect the crops, and of course it becomes an object to suit the produce to them; and to form fences, enclosures, and plantations accordingly.

4368. *A maritime position* occasions a more equal temperature in a climate. Where a great body of land is exposed to the heating rays of the sun, the air becomes much warmer than it would if resting upon a small body of land, contiguous to, or surrounded by the ocean. On the other hand, as the sea always preserves nearly the same temperature, and, except in the most northern regions, is never frozen, it communicates warmth, in the cold seasons of the year, to the air passing over it, which had been cooled in its passage over continents covered with ice and snow. Hence islands are more temperate than continents. It appears indeed, that the thermometer has not so great a range on the sea coast, as in the more inland parts of Great Britain, even at an elevation of 400 feet above the level of the sea. Of the influence of proximity to the sea, many proofs might be brought forward. It is in consequence of this circumstance, that the city of Moscow, which is situated somewhat farther south than Edinburgh, experiences winters much more severe. Another effect of a maritime position is, that strong winds which blow from the sea, are sometimes accompanied by salt spray, or vapor, which is injurious to crops of grain, and the leaves of trees. But when it comes in moderation, those saline particles, with which the westerly winds are loaded, contribute to the verdure of the fields in pasture.

4369. *The nature of the inland position* is also of much importance. The relative position of the neighboring hills, occasioning a material difference of climate, exposing some districts to great severity of weather, and by protecting others from that disadvantage, greatly promoting their fertility.

4370. *In many countries the seasons are regular.* In others, as in Great Britain, they are extremely variable, and often change, in the space of a few hours, from dry to moist, from hot to cold, from clear to cloudy, and from a pleasant serenity to all the violence of a tempest. But such irregularities of climate, however uncomfortable, are often favorable to vegetation, and compensated by the advantages they produce. It is not in countries where the seasons of heat and cold, wind and rain, are periodical, or where the greatest regularity of climate takes place, that mankind are the most healthy or vigorous, or the useful productions of the soil most perfect. Perhaps a sameness of climate, as well as of other things, is prejudicial rather than useful. Where a climate is inconstant, the air is refined and purified by the frequent changes it undergoes; and the disadvantages which originate from that source, are often counteracted, or at least essentially mitigated, by judicious management, and persevering exertions.

4371. *The climate of a country is likewise affected* by atmospheric and natural phenomena; by earthquakes; volcanos; violent thunder storms; lightning; hail storms in summer; early frosts; whirlwinds and hurricanes; water-spouts; and by that atmospheric appearance, known under the name of the *aurora borealis*, so frequently to be seen in northern, and sometimes, even in southern regions; but these phenomena, for the most part only occasional, sometimes prevent greater calamities, and in this country are rarely attended with permanent evils.

4372. *Early frosts* are highly injurious to the blossoms of fruit trees; and autumnal frosts creep along the banks of rivers, destroying the corn in the flowering season, and blasting the stems of potatoes in low situations. Winter frosts are ultimately rather favorable to vegetation; and snow, particularly when it covers the ground for some time, and gradually melts away.

4373. *The size, and, in many cases, the value of the productions of a country, depend upon its climate*, by whose influence their growth may either be advanced or retarded. The same species of tree, which, in a temperate climate, will rise to a great height, and swell to an immense size, in an exposed situation will remain small and stunted. By a favorable climate also, the most barren spots, which in a cold country must remain completely waste, in a warm one may be rendered productive. Thus, where the climate is adapted to the culture of the vine; rocks, which in Great Britain, and in colder countries, would in general be of little or no worth, in the southern provinces of France may yield as much in valuable produce, as the cultivated land in their neighborhood. The real excellence of a climate, however, depends on its yielding, in perfection and abundance, the necessaries of life, or those which constitute the principal articles of food for man, and for the domestic animals kept for his use. In this point of view, a meadow is much more productive, and in some respects more valuable than either a vineyard or a grove of oranges; though the one may be situated in a cold and variable climate, and the other in a country celebrated both for its regularity and warmth of temperature.

4374. *Even the nature of the articles raised*, depends upon the climate. Thus, in many elevated parts, both of England and Scotland, wheat cannot be grown to advantage,

and in some of the high-lying districts of the latter, it has never been attempted. In several of the northern counties, it has been found necessary to sow, instead of the two-rowed barley, the inferior sort called bear, or big; and oats, from the hardy quality of the grain, are found to be a more certain and more profitable species of corn, than any other; while in humid districts, peas or beans cannot be safely cultivated, from the periodical wetness of the autumn. On the whole, without great attention to the nature of the climate, no profitable system can be laid down by any occupier of land.

4375. *An inferior climate greatly augments the expenses of cultivation*, because a number of horses are required for labor, during the short period of the year, when the weather will admit of it, which, at other seasons, are a useless burden upon the farm. When to this are joined an uneven surface, and an inferior quality of soil, arable land is of little value, and yields but a trifling rent.

4376. *Exotic plants or animals* can only be naturalized in climates with success by paying attention to that whence they were brought, and by endeavoring, either to render the one as similar to the other as circumstances will admit of, or to counteract, by judicious management, the deficiencies of the new one.

4377. *In order to ascertain the nature of a climate*, the farmer, in modern times, has many advantages which his predecessors wished for in vain. The progress of science has given rise to many new instruments, which ascertain natural phenomena with a considerable degree of accuracy, instead of conjectures, or systems being founded on loose or general experience. It may still be proper to study the appearance of the heavens, and not to despise old proverbs, which often contain much local truth; but the vane now points out the quarters whence the winds blow, with all their variations; the barometer, often enables us to foretell the state of the weather that may be expected; the thermometer ascertains the degree of heat; the hygrometer, the degree of moisture; and the pluviometer, or rain-gauge, the quantity of rain that has fallen during any given period; and by keeping exact registers of all these particulars, much useful information may be derived. The influence of different degrees of temperature and humidity, occurring at different times, may likewise be observed, by comparing the leafing, flowering, and after-progress of the most common sorts of trees and plants, in different seasons, with the period when the several crops of grain are sown and reaped each year.

SECT. II. *Of Soil in respect to farming Lands.*

4378. *The necessity of paying attention to the nature and quality of the soil*, need not be dwelt upon. By ascertaining the qualities it possesses, or by removing its defects, the profits of a farmer may be greatly increased. He must, in general, regulate his measures, accordingly, in regard to the rent he is to offer; the capital he is to lay out; the stock he is to keep; the crops he is to raise; and the improvements he is to execute. Indeed, such is the importance of the soil, and the necessity of adapting his system to its peculiar properties, that no general system of cultivation can be laid down, unless all the circumstances regarding the nature and situation of the soil and subsoil be known; and such is the force of habit, that it rarely happens, if a farmer has been long accustomed to one species of soil, he will be equally successful in the management of another. From the attention to the nature of soils, many foolish, fruitless, and expensive attempts have been made to introduce different kinds of plants, not at all suited to them; and manures have often been improperly applied. This ignorance has likewise prevented many from employing the means of improvement, though the expense was trifling, and within their reach. From ignorance also of the means calculated for the proper cultivation of the different soils, many unsuccessful and pernicious practices have been adopted. Soils may be considered under the following general heads: Sandy; gravelly; clayey; stoney; chalky; peaty; alluvial; and loamy, or that species of artificial soil, into which the others are generally brought, by the effects of manure, and of earthy applications, in the course of long cultivation.

4379. *Though sandy soils are not naturally valuable*, yet being easily cultivated, and well calculated for sheep, that most profitable species of stock, they are often farmed with considerable advantage; and when of a good quality, and under a regular course of husbandry, they are invaluable. They are easily worked, and at all seasons; they are cultivated at a moderate expense; are not so liable to injury from the vicissitudes of the weather; and in general they are deep and retentive of moisture, which secures excellent crops even in the driest summers. The crops raised on sandy soils are numerous, such as common turnips, potatoes, carrots, barley, rye, buck-wheat, pease, clover, saintfoin, and other grasses. This species of soil, in general, has not strength enough for the production of Swedish turnips, beans, wheat, oats, flax, or hemp, in any degree of perfection, without much improvement in its texture, the addition of great quantities of enriching manure, and the most skilful management. In Norfolk and Suffolk, it is found that poor sandy soils, unfit for any other purpose, under saintfoin, will produce, after the first year, about two tons per acre, of excellent hay, for several years, with an after-grass,

extremely valuable for weaning and keeping lambs. How much more beneficial, than any crops of grain that such soils usually yield ! (*Young's Kalend.* 193.)

4380. *The fertility of sandy soils*, is in proportion to the quantity of rain that falls, combined with the frequency of its recurrence. As a proof of this, in the rainy climate of Turin, the most prolific soil has from seventy-seven to eighty per cent. of siliceous earth, and from nine to fourteen of calcareous ; whereas in the neighborhood of Paris, where there is much less rain, the silex is only in the proportion of from twenty-six to fifty per cent. in the most fertile parts.

4381. *Gravelly soils* differ materially from sandy, both in their texture and modes of management. They are frequently composed of small soft stones, sometimes of flinty ones ; but they often contain granite, limestone, and other rocky substances, partially, but not very minutely decomposed. Gravel, being more porous than even sand, is generally a poor, and what is called, a *hungry soil*, more especially when the parts of which it consists, are hard in substance, and rounded in form. Gravelly soils are easily exhausted, for the animal and vegetable matters they contain, not being thoroughly incorporated with the earthy constituent parts of the soil, (which are seldom sufficiently abundant for that purpose,) are more liable to be decomposed by the action of the atmosphere, and carried off by water.

4382. *A gravelly soil*, free from stagnant water, gives such an additional warmth to the climate, that vegetation is nearly a fortnight earlier, than where other soils predominate. About Dartford and Blackheath, in Kent, such soils produce early green pease, winter tares, rye, autumnal pease, and occasionally wheat, in great perfection.

4383. *Gravelly soils, in a wet climate*, answer well for potatoes ; in Cornwall, in a sheltered situation, with a command of sea-sand, and of sea-weed, they raise two crops of potatoes in the same year.

4384. *Poor gravelly soils, full of springs*, and those sulphureous, are very unfriendly to vegetation ; and are better calculated for wood than for arable culture.

4385. *The stoney, shaly, or stone-brash soils* of Gloucestershire, and the midland counties of England, are much mixed with small stones, but have more frequently sand, or clay, or calcareous loam, in their composition, than gravelly soils, and are therefore generally preferable.

4386. *A clayey soil* is often of so adhesive a nature, that it will hold water like a dish. In a dry summer, the plough turns it up in great clods, scarcely to be broken or separated by the heaviest roller. It requires, therefore, much labor to put it in a state fit for producing either corn or grass, and it can only be cultivated, when in a particular state, and in favorable weather. Though it will yield therefore, under a proper system of management, great crops, yet being cultivated at a heavy expense, requiring stronger instruments, and stouter horses, it is seldom that much profit is obtained, unless when occupied by a judicious and attentive farmer. The best management of clay soils, is that of the Lothians. There they are found well calculated for growing crops of beans, wheat, oats, clover, and winter tares ; but are not adapted for barley, unless immediately after a fallow ; nor for potatoes, unless under very peculiar management. In regard to turnips, they do not usually thrive so well in clays, as in soils which are more free and open. But it is now ascertained, that the Swedish, and above all, the yellow turnip, may be raised in them with advantage ; that the quality is superior ; that if they are taken up early, the soil is not injured ; and that there is no difficulty in preserving them. Clays become good meadow-lands, and answer well for hay, or soiling, when in grass ; but from their aptitude to be poached, they are, in general, unfit to be fed by heavy cattle in wet weather. In dry seasons the after-grass may be used to feed neat cattle till October, and sheep till March. A stiff clay, when not cold or wet, with a strong marl under it, is preferred in Cheshire and Derbyshire, for the dairy.

4387. *On reclaimed peat-bogs*, oats, rye, beans, potatoes, turnips, carrots, cole-seed, white and red clover, may be cultivated. Wheat and barley have succeeded on such lands, after they have been supplied with abundance of calcareous earth ; and the florin grass (*Agrostis stolonifera*), seems likewise to be well adapted to that description of soil in a warm climate. In Leicestershire, and other counties, they have great tracts of meadow land, which, in many instances, are the sites of lakes filled up, the soil of which is composed of peat and sediment ; the former originally formed by aquatic vegetation, and the latter brought down by rains and streams from the upland. This forms a soil admirably calculated for grass.

4388. *The fens* in Cambridgeshire, Lincolnshire, and several other districts in England, consist of peat and sediment.

4389. *Chalky soils* principally consist of calcareous matter, mixed with various other substances, in greater or lesser proportions. Where clayey or earthy substances are to be found in such soils in considerable quantities, the composition is heavy and productive ; where sand or gravel abounds, it is light, and rather unfertile. The crops chiefly culti-

vated on chalky soils, are pease, turnips, barley, clover, and wheat; and however much the soil is exhausted, it will produce saintfoin.

4390. *Chalky soils are in general fitter for tillage than for grazing; for without the plough, the peculiar advantages derived from this soil by saintfoin, could not be obtained.* The plough, however, ought not to extend to those fine chalky downs, (called ewe leases in Dorsetshire), which, by a very attentive management during a number of years, have been brought to a considerable degree of fertility as grazing land, and which are so useful to sheep in the winter season. A chalky soil that has been in tillage, permits water to pass through it so freely in winter, and is so pervious to the sun's rays in summer, that it is the work of an age to make it a good pasture of *natural grasses*, more especially when the chalk lies near the surface. Hence, in the western counties of England, several thousands of acres of this soil, though not ploughed for thirty years, have scarcely any grass of tolerable quality upon them, and are literally worth nothing. Such soils ought to be laid down with saintfoin.

4391. *Alluvial soils* are of two sorts; one derived from the sediment of fresh, and the other of salt water. Along the sides of rivers, and other considerable streams, water-formed soils are to be met with, consisting of the decomposed matter of decayed vegetables, with the sediment of streams. They are in general deep and fertile, and not apt to be injured by rain, as they usually lie on a bed of open gravel. They are commonly employed as meadows, from the hazard of crops of grain being injured, or carried off by floods, if cultivated.

4392. *Alluvial soils, arising from the operations of salt water, called salt marshes* in England, *carres* in Scotland, and *polders* in Holland and Flanders, are composed of the finest parts of natural clay, washed off by running water, and deposited on flat ground, on the shores of estuaries, where they are formed by the reflux of the tide, and enriched with marine productions. They generally have a rich, level surface, and being deep in the staple, they are well adapted for the culture of the most valuable crops. Hence wheat, barley, oats, and clover, are all of them productive on this species of soil; which is likewise peculiarly well calculated for beans, as the tap-root pushes vigorously through it, and finds its nourishment at a great depth. From the great mass of excellent soil, the fertility of these tracts is nearly inexhaustible; but from their low and damp situations, they are not easily managed. Lime, in considerable quantities, is found to answer well upon this species of soil.

4393. *The term loamy soil* is applied to such as are moderately cohesive, less tenacious than clay, and more so than sand. Loams are the most desirable of all soils to occupy. They are friable; can in general be cultivated at almost any season of the year; are ploughed with greater facility, and less strength than clay; bear better the vicissitudes of the seasons; and seldom require any change in the rotation adopted. Above all, they are peculiarly well adapted for the convertible husbandry; for they can be changed, not only without injury, but generally with benefit, from grass to tillage, and from tillage to grass.

4394. *As to the comparative value of soil*, it has been justly remarked, that too much can hardly be paid for a good soil, and that even a low rent will not make a poor one profitable. The labor of cultivating a rich and a poor soil, is nearly the same; while the latter requires more manure, and consequently is more expensive. Poor soils, at the same time, may have such a command of lasting manures, as lime or marl, or even of temporary sorts, like sea-weed, or the refuse of fish, as may render them profitable to cultivate. It is a wise maxim in husbandry, that the soil, like the cattle by whom it is cultivated, should always be kept up in good condition, and never suffered to fall below the work it may be expected to perform.

SECT. III. Of Subsoil relatively to the Choice of a Farm.

4395. *On the nature of the under-stratum* depends much of the value of the surface soil. On various accounts its properties merit particular attention. By examining the subsoil, information may be obtained in regard to the soil itself; for the materials of the latter are often similar to those which enter largely into the composition of the former, though the substances in the soil are necessarily altered, by various mixtures, in the course of cultivation. The subsoil may be of use to the soil, by supplying its deficiencies, and correcting its defects. The hazard and expense of cultivating the surface are often considerably augmented by defects in the under-stratum, but which, in some cases, may be remedied. Disorders in the roots of plants are generally owing to a wet or noxious subsoil. Subsoils are retentive, or porous.

4396. *Retentive subsoils* consist of clay, or marl, or of stone beds of various kinds. A retentive, clayey subsoil is in general found to be highly injurious. The surface soil is soaked with water, is ploughed with difficulty, and is usually in a bad condition for the exertion of its vegetative powers, until the cold sluggish moisture of

the winter be exhaled. By the water being retained in the upper soil, the putrefactive process is interrupted, and manures are restrained from operating, consequently the plants make but little progress. Hence, its grain is of inferior quality, and when in grass, its herbage is coarse.

4897. *A stoney subsoil*, when in a position approaching to the horizontal, is in general prejudicial, and if the surface-soil be thin usually occasions barrenness, unless the rock should be limestone, and then the soil, though thin, can easily be converted into healthy pastures, and, in favorable seasons, will feed a heavy stock. They will also produce good crops of corn, though subject to the wire-worm.

4398. *A porous subsoil* is uniformly attended with this advantage, that by its means all superfluous moisture may be absorbed. Below clay, and all the variety of loams, an open subsoil is particularly desirable. It is favorable to all the operations of husbandry; it tends to correct the imperfections of too great a degree of absorbent power in the soil above; it promotes the beneficial effects of manures; it contributes to the preservation and growth of the seeds; and ensures the future prosperity of the plants. Hence it is, that a thinner soil, with a favorable subsoil, will produce better crops than a more fertile one, incumbent on wet clay, or on cold and non-absorbent rock. Lands whose substratum consists of clean gravel or sand, can bear little sun, owing to their not having the capacity of retaining moisture, and their generally possessing only a shallow surface of vegetable mould. In England this soil was formerly called *rye-land*, being more generally cropped with that species of grain than any other. When such soils are cultivated for barley, they should be early and thick, with seed soaked forty-eight hours in water, or in the exudation from a dung-heap. Thus its simultaneous germination, and ripening at the same time, may be secured.

SECT. IV. *Of the Elevation of Lands relatively to Farming.*

4399. *The elevation of lands above the level of the sea* has a material influence on the kind and quality of their produce. Land in the same parallel of latitude, other circumstances being nearly similar, is always more valuable in proportion to the comparative lowness of its situation.

4400. *In the higher districts* the herbage is less succulent and nourishing, and the re-production slower when the land is in grass; while the grain is less plump, runs more to straw, is less perfectly ripened, and the harvest is also later when the produce is corn. It has been calculated that in Great Britain sixty yards of elevation in the land are equal to a degree of latitude; or, in other words, that sixty yards perpendicularly higher, are, in respect of climate, equal to a degree more to the north. In considering the crops to be raised in any particular farm, attention ought therefore to be paid to its height above the level of the sea, as well as to its latitude. In latitude 54° and 55° , an elevation of 500 feet above that level is the greatest height at which wheat can be cultivated with any probable chance of profit; and even there the grain will prove very light, and will often be a month later in ripening than if sown at the foot of the hills.

4401. *The usual maximum of elevation* may be reckoned between 600 and 800 feet for the more common sorts of grain; and in backward seasons the produce will be of small value, and sometimes will yield nothing but straw. It is proper, at the same time, to remark, that in the second class of mountains in the county of Wicklow, in Ireland, where no other grain is considered to be a safe crop, rye is cultivated with success. Where the soil is calcareous, however, as on the Gloucestershire and Yorkshire wolds, from the superior warmth of that species of soil, compared to cold clays or peat, barley grows in great perfection at an elevation of 800 feet above the level of the sea. Some experiments have been made to raise corn crops, at even a higher elevation, on the celebrated mountain Skiddaw, in Cumberland, but unsuccessfully.

4402. *The greatest height at which corn will grow*, in the more remote parts of Scotland, so as to yield any profit to the husbandman, is stated to be at 500 feet above the level of the sea. At the same time corn has been produced, in other districts of that country, at still higher elevations, in particular at the following places:—

Feet above the Level of the Sea.		Feet above the Level of the Sea.	
Parish of Hume, in Roxburghshire	600	Doubruch, in Braemar, Aberdeenshire	1294
Upper Ward of Lanarkshire	760	Lead-hills, in Lanarkshire	1564

4403. *These and other instances* of land being cultivated on high elevations, however, are merely small spots, richly manured, and, after all, producing nothing but crops of inferior barley and oats, and seldom fully ripe or successfully harvested. It is only where the soil is sandy or gravelly, that corn will at all answer in Scotland on such elevated situations; and even then, only when the seasons are propitious, and when there are local advantages, favorable to warmth and shelter, in the situation of the lands.

SECT. V. *Character of Surface in regard to farming Lands.*

4404. *A hilly irregular surface*, whether at a high or low elevation above the sea, is unfavorable to farming. The labor of ploughing, driving home produce, and driving out manure, are greatly increased, while the soil on the summit of steep hills, mounts, or declivities, is unavoidably deteriorated. On the sides of slopes the finer parts of the clay and mould are washed away, while the sand and gravel remain. Hence the soil in such districts often wants a proper degree of tenacity for supporting corn crops. A great part of the manure that is applied in such situations, is likewise soon lost. From various causes also they are colder than the plains.

4405. *Many extensive countries have no perceptible rise.* These have their advantages from uniformity of soil, where it is rich. In other districts, the surface is of a waving description, an inequality which contributes much to the ornament of the country, by the agreeable relief which the eye constantly meets with in the change of objects; while the universal declivity which prevails more or less in every field is favorable to the culture of the land, by allowing a ready descent to any water with which the surface may be encumbered.

SECT. VI. *Of Aspect in respect to farming Lands.*

4406. *Aspect, in hilly or mountainous districts*, is an important subject of attention to the farmer; more especially where the climate is unfavorable. It is proved in a variety of instances, both in the central highlands of Scotland, and in other parts of the kingdom, that where the aspect of a hill is towards the north, the soil is more fertile than when it lies with a southern exposure. This is attributed to the variations from frost to thaw in the spring months, which are greater in a southern than a northern aspect. Hence, while the soil to the north remains locked fast, and secured from waste, the other is loosened by the sun, and carried off by showers falling in the intervals of thaw.

4407. *Soils which face the south* are more liable to have their substance carried away by heavy rains, which are generally impelled from the south and south-west. But though the soil to the north often produces the heaviest crops of grass and hay, yet from possessing a more genial climate, and from the earlier and more powerful action of the sun, both corn and grass are harvested earlier on land which has a southern, than on that which has a northern aspect; and superiority of quality thus compensates for any inferiority in the quantity of the produce.

SECT. VII. *Of the Situation of Farm Lands in regard to Markets.*

4408. *No farming can go on without markets.* The system of farming to be adopted on any particular farm, and the expense attending it, must materially depend on its situation, in regard to markets; to the facility with which its produce can be conveyed, where a contiguous market is wanting; to vicinity to manure, to fuel, and to water.

4409. *The advantages resulting from a vicinity to a market*, or to a large town, by which that is insured, are very great. Some crops, as those of potatoes, turnips, and clover, are frequently sold on the ground, without any further trouble or expense to the farmer; and great quantities of manure may be purchased at a moderate expense. In such situations also there is a ready sale for every article the farm can produce; and the articles sold are not only brought to market at a small expense, but the payment is immediate. For all these reasons, it is contended, and apparently with justice, that the neighborhood of a capital is the most profitable spot to farm in, notwithstanding the high rent of land, and the great expense of labor.

4410. *Where markets are not at hand*, the farmer ought to take into consideration what articles will best suit those at a distance to which his produce must be sent. In such a situation, unless there are facilities for the conveyance of so bulky an article as corn by good roads, or by water-carriage, it is advisable, instead of cultivating grain, to attend either to the dairy husbandry, or to the breeding of stock which can be fattened in other districts where good markets are more numerous. This plan, by which the dairy, the breeding, and the fattening of stock, are made distinct professions, is highly beneficial to the country at large. Stock can be reared cheaper in remote districts than where land is dear and labor high. On the other hand, the purchaser of lean stock avoids the expense and risk of breeding great numbers of animals. His attention is not distracted by a multiplicity of objects; he can alter his system from cattle to sheep, or from sheep to cattle, as is likely to be most profitable; his business is simplified, and the capital he lays out is speedily returned. The division of professions between breeding and feeding (though they may be united in circumstances peculiarly favorable), is on the whole a most important link in the progress of agricultural prosperity.

4411. *In regard to facility of conveyance*, the state of public roads, bridges, iron railways, canals, rivers rendered navigable, and harbors, deserves the consideration of the farmer, and will most materially influence the value of produce.

4412. *The situation of the farm in regard to manures*, for an easy access to lime, chalk, marl, sea-weed, &c. is of essential advantage to cultivation. The price at which these articles can be purchased, their quality, their distance, and expense of conveyance, are likewise of importance. Farms, for example, possessing the advantage of sea-weed contiguous, and in abundance, can pay from fifteen to twenty per cent. more rent per acre than otherwise could be afforded.

4413. *Vicinity to fuel* in the cold and moist regions of Europe, are important considerations to the farmer. In the same county, even in England, the difference of expense is often material. In the Hebrides, from the moistness of the climate, the expense of fuel is reckoned equal to a third part of the rent of the land; and farmers who pay, in some cases, 150*l.* per annum, would give 200*l.* if the landlord would supply them and their servants with fuel.

4414. *Where a farmer is under the necessity of using peat*, from the labor attending the cutting, spreading, drying, and conveying it from a distance, several weeks of his horses and servants are devoted to that sole purpose; and much valuable time is lost, which ought to have been employed in the cultivation of his farm. It has been well remarked, that many farmers, to save five guineas on coal, often expend twenty, in thus misapplying the labor of their horses.

4415. *Where wood is used*, it occupies a great deal of ground, that might often be cultivated to advantage: and it is not of a lasting quality. Coal is preferable, for general purposes, to every other species of fuel; and besides its domestic application, its superiority for burning lime, that important source of fertility, or calcareous clay, also of much value to the farmer, is an object of great moment. The tenant, therefore, who resides in the neighborhood of coal, more especially if limestone or calcareous substances are at no great distance, farms at less expense, can afford to pay a higher rent, and may derive more profit from the land he cultivates, than if in these respects he were differently circumstanced.

SECT. VIII. *Of the Extent of Land suitable for a Farm.*

4416. *The extent of ground which a farmer proposes to occupy, demands due consideration.* If it be beyond his capital to cultivate or improve, he can derive no profit by taking it. On the other hand, a small occupation may not be worthy of his attention.

4417. *Farms as to size may be divided into three sorts*: small farms under 100 acres; moderate-sized farms, from 100 to 200 acres; large farms, from 200 to 1000 acres, and upwards, of land fit for cultivation. The expense of labor is now so great, and the rent of land so high, that the profits of a small farm are not sufficient, with the utmost frugality, or even parsimony, to maintain a family with comfort.

4418. *Moderate-sized farms* are well calculated for the dairy system, for the neighborhood of large towns, and where capital is not abundant. There are few trades, in which a small capital can be employed to a greater advantage than in a dairy farm, yet there is no branch of agriculture where such constant and unremitting attention is required. That is not to be expected from hired servants; but it is in the power of the wives and daughters of the farmer to perform, or at any rate to superintend, the whole concern, without whose aid it cannot be rendered productive.

4419. *Moderate-sized farms* are general in the neighborhood of towns. This necessarily results from the high rents paid in such situations; the shortness of the leases usually granted of land near towns; and the necessity the farmer is under, of selling, in small quantities, the articles produced on his farm. On this subject it has been remarked, that farmers in the vicinity of large towns resemble retail shopkeepers, whose attention must be directed to small objects, by which a great deal of money is got, the greater part of which would be lost, without the most unremitting attention. The farmer at a distance from markets, who cultivates on a great scale, may be compared, on the other hand, to a wholesale trader, who, as his profits are less, requires a greater extent of land, for the purpose both of engaging his attention, and of enabling him to support that station of life in which he is placed. There is this difference also between farmers in the neighborhood of towns, and those who reside at a distance from them, that the former find it more profitable to sell their produce, even such bulky articles as turnips, potatoes, clover, hay, and straw, than to fatten cattle for the butcher; and they are enabled to do so, without injury to their farms, as they can procure dung in return.

4420. *Farms of the largest size* differ in respect to the capital required. A mountain breeding farm of 5000 acres will not require more to stock it than an arable farm of 500 acres, and much less expense of labor to carry it on. In all cases the safe side for the farmer to lean to, is to prefer a farm rather under than exceeding his capital: and let him consider well beforehand whether he is going to commence a retail farmer for

daily markets, or a manufacturer of produce on a large and ample scale; for the spirit, attention, and style of living of the one differs materially from that of the other.

SECT. IX. *Of the Tenure on which Lands are held for Farming.*

4421. *Perpetual tenures*, or absolute property in land, can never come into consideration with a farmer looking out for a farm. A proprietor cultivating his own property cannot, in correct language, be said to be a farmer, for to constitute the latter an essential requisite is the payment of rent.

4422. *The leases on which lands are let for farming*, are for various terms and with very different covenants. The shortest lease is from year to year, which unless in the case of grass lands in the highest order, and of the richest quality, or in some other very peculiar circumstances, no prudent man, whose object was to make the most of his skill and capital, would accept of. Even leases for seven or ten years are too short for general purposes; fourteen or fifteen years seems to be the shortest period for arable lands so as to admit of the tenant paying a full rent; but fourteen years, when the lands to be entered on are in bad condition, is too short a period, and twenty-one years much better for the true interest of both parties. In farming, however, as in every other occupation where there is more skill and capital in want of employment than can find subjects to work on, farms will be taken under circumstances, both in regard to leases and rent, that are highly unfavorable to the farmer; and if they do not end in his ruin will keep him always poor, and probably not only pay less interest for his capital than any other way in which he could have employed it, but also infringe on its amount. The rapid depreciation of currency which took place in Britain during the wars against the French deceived many farmers, and flattered them for a time with the gradual rise of markets year after year. However high land might be taken at the commencement of a lease, it was always considered a consolation that it would be a bargain by the time it was half done; and that the farmer's fortune would be made during the last few years of its endurance. When the currency of Britain was permitted to find its level with that of other countries, the delusion ceased, and the majority of farmers partially or wholly ruined.

4423. *In regard to the covenants of a lease*, it is necessary that there should be such in every one as shall protect both landlord and tenant. Certain general covenants in regard to repairs, renewals if necessary, timber, minerals, entry and exit crops, are common to all leases. Regulations as to manure are required where hay and straw, and other crops, are sold not to be consumed on the farm. Water meadows, rich old grass lands, copse woods, hop grounds, orchards &c., require special covenants. Fewest covenants are required for a mountain breeding farm; and in all cases there should be a clause entitling the tenant to an appeal, &c. and a hearing from the landlord, and perhaps a jury of landlords or agents and farmers, against covenants as to cropping, repair, or renewals, which may, from extraordinary circumstances, press particularly heavy on the tenant.

4424. *The power of the landlord to grant a lease*, with liberal conditions, may in some cases be required to be ascertained by the tenant; and in Scotland, where it is illegal to sublet a farm unless a clause to that effect has been asserted in the original lease, a farmer may cease to be the master of his own property, unless he has taken care to see that clause inserted. In England, as in every country where the laws are founded in equity, subletting a farm is no more prohibited than subletting a dwelling-house or a shop.

SECT. X. *Of Rent.*

4425. *The rent of land*, in a general point of view, must always depend on a variety of circumstances; as the wealth of the country; its population; the price of produce; the amount of public and other burdens; the distance from markets; the means of conveyance; the competition among farmers; and other less important considerations; but the rent of any particular farm must be regulated by the nature of the soil; the duration of the tenure, and the covenants contained in the lease; the capital to be invested by the farmer in its culture; and the expenses to which he is liable.

4426. *The rent of poor land* cannot possibly be the same as in the case of fertile lands. The labor of ploughing, harrowing, sowing, &c. when the land is in cultivation, is nearly the same, and yet the produce is greatly inferior, not only in quantity, but in quality. Indeed, where the produce is inconsiderable, or the quality much inferior, the whole, or nearly the whole, may be swallowed up by the expense of labor, and no rent whatever can be afforded, more especially in adverse seasons.

4427. *The duration of the tenure* must have a considerable effect in fixing the rent. No farmer can afford to pay the same sum for land on a short, as if he held it on a long lease. The covenants, also, which are in fact a species of rent, must influence the money payments.

4428. *Rent must also depend on the capital invested in the cultivation of the farm.*

Thus, if a farmer can lay out only 4*l.* of capital per acre, he may not be able to afford for it a higher rent than 10*s.* per acre; if he lays out 7*l.* he may pay 14*s.*; and with a capital of 10*l.* per acre, he may be enabled to pay 18*s.* or 20*s.* of rent.

4429. *The proportion of produce which should be paid as rent*, is a question that has long been considered as abstruse, mysterious, and very difficult to resolve. Some have supposed, that one-fifth was a reasonable proportion, while others contend for a fourth, or even a third part of the produce of arable land. But all former calculations on this subject are rendered fallacious by the effects of modern improvements. The rent ought certainly to depend upon the amount of the disposable produce; and that produce in grain is greatly augmented, both by a diminution of the consumption on the farm, effected by improved implements, and a more correct arrangement of labor, and likewise a better cultivation of the land in tillage. Hence, while the price of wheat has greatly advanced during the last twenty years, above the average price of the preceding twenty, the rent of land has not only risen, but in a higher proportion. More grain, and that of a better quality, has been produced on the same extent of land, and a greater amount of disposable surplus has gone to market. Out of this surplus disposable produce, it is evident, that the rent must be paid. But it is difficult to divide its amount between the landlord and tenant, as so much depends upon the seasons, and on the prices of the different articles which the farm produces. In bad seasons also, every deficiency of produce, in the acres set apart for supporting home population, must be made up from the disposable surplus; nor is it possible to apply the same rules to all situations, soils, and climates, in all the various districts of an extensive country. It may be proper, however, to give some general idea of the proportion of produce paid as rent, in Scotland, and in England.

4430. *In Scotland*, the following table states what is considered to be a fair proportion, where the land is cultivated:

	Per acre.
Where land produces 10 <i>l.</i> 10 <i>s.</i> per acre per annum, one-third, or	£ 3 11 0
Where land produces 6 <i>l.</i> 15 <i>s.</i> per annum, one-fourth, or	1 15 0
Where land produces only 4 <i>l.</i> 5 <i>s.</i> per acre, one-fifth, or	0 17 0

4431. *In regard to grazing farms*, they are let on principles totally different from the arable; namely, according to the quantity of stock they can maintain; and as they are not liable to the same expense of management, both the landlord and the tenant receive larger shares of the produce than in the case of arable farms.

4432. *In England*, the tenant is allowed, on arable land, what is considered to be one moiety of the surplus, after defraying the expenses of cultivation, the taxes to which he is liable, and every other outgoing. Hay land requires much less of his attention, and for this he only obtains one-third of the surplus. But the profits of grazing, depending much on superior judgment in buying and selling stock, as well as skill in preventing, or curing their diseases, the grazier is entitled to a share of the surplus, fully equal to that of his landlord. It has been contended, as a general principle, that as both the expense of cultivating land, and the value of its produce, are infinitely various, a farmer ought to calculate what profit he can make on his whole farm, without entering into details; it being of little consequence to him, whether he pays at the rate of 10*l.* or 10*s.* per acre, provided he makes an adequate interest on the capital invested. That is certainly a fair criterion on which a tenant may calculate what he ought to offer; but a landlord, in estimating the rent he ought to insist on, will necessarily take into his consideration, the produce that his land is capable of yielding, and what proportion of it, or of its value, at a fair average, he has reason to expect, under all the circumstances of the case.

4433. *What the profits are to which a farmer is entitled*, is a subject of much dispute. On the one hand it is contended, that the produce of land is of such universal and absolute necessity to the existence of mankind, that it is not reasonable it should yield to him who raises it, more than a fair profit. On the other hand it is urged, that a farmer is entitled to be fully recompensed for the application of a considerable capital, exposed to the uncertainty of the seasons, when it is managed with economy, and conducted with industry and skill; and it has also been observed, that it is seldom more money is got by farming, than an adequate interest for the capital invested. This is owing to competition, the articles produced being in numberless hands, who must bring them to market; and necessity, the goods of the farmer being in general of a perishable nature, on the sale of which he depends, for the payments he has to make, and the subsistence of his family. To prove how moderate the profits of farming in general are, it appears from the most careful inquiries, that on arable farms they rarely exceed from ten to fifteen per cent. on the capital invested, which is little enough, considering that few employments are more subject to casualties than farming, or require more uniform attention. Some arable farmers, possessed of superior skill and energy, and who have got leases on reasonable terms, may clear from fifteen to twenty per cent.,

while others, who are deficient in these qualities, or pay too high rents, frequently become insolvent. Certain it is, that the great majority of farmers merely contrive to live and bring up their families; adding little or nothing to their capital, but that nominal addition which takes place in consequence of the depreciation of the currency.

4434. In *grazing farms* the case is different, as they are attended with less expense of labor, and produce articles of a more luxurious description, for which a higher price will be given. Hence, in such farms, fifteen per cent. and upwards, is not unusual. Besides, the grazier is more of a trader than the mere arable farmer; is frequently buying as well as selling stock, and sometimes makes money by judicious speculations, though occasionally, from a sudden fall of stock, his losses are considerable. The grazier who breeds superior stock, and thence incurs great expense, is certainly well entitled to more than common profit for his skill and attention.

4435. In regard to *the mode in which rent should be paid*, it is proper to consider, whether the whole, or at least part of the rent, ought not to depend upon the price of grain, not for the season, but on an average of a certain number of years preceding that for which the rent is due. By this plan, neither the landlord nor the tenant can suffer from the fluctuating price of grain, whereas, without some such arrangement, the tenant, on the one hand, cannot make a fair offer of rent, lest the price of grain should fall too low; nor on the other hand, can the landlord grant a lease of considerable duration, lest the price of grain should, in the progress of time, rise much higher. It seems therefore to be for the interest of both parties, that on arable farms a part of the rent should be payable in money and part in corn, and not in kind, but in money, according to the average value of a number of years. This plan is enforced by law to the extent of one-third in college leases, and thus an income is secured in some degree proportioned to the value of money. It is not, however, without its difficulties. The amount of rent for improvable and well cultivated farms, does not depend so much on the price of grain as is commonly imagined. A large proportion of such farms usually produce green crops, the value of which depends upon the prices of beef, mutton, and wool, and not on that of grain. Various circumstances also may arise, which may reduce the price of particular sorts of grain below its usual level, (for example, barley, when the distilleries are stopped); or may raise it disproportionately much higher, in case a large proportion of the wheat crop should be destroyed by rust or mildew. But if the proposed payment, by the conversion of corn into money, be extended to the various sorts of grain usually cultivated in the district, and be restricted to one-half of the rent, it does not seem liable to any material difficulty. If the payment also depends on the average of seven or more years, the main objection to a corn rent, that the farmer is often liable to pay the most when he is the least able to do it, is removed. (See 4327.)

4436. *The periods of payment* ought to be made so convenient to the tenant, that he may not be under the necessity of selling the produce of his farm to disadvantage, for the sake of ready money (4340.), nor should he be compelled to pay his rent out of his capital, for that would cripple all his future exertions. The periods should vary according to the nature of the occupation, and the time when the tenancy commenced. On the whole, the most successful farmers are those, who embark a capital sufficiently large in their undertaking; who feel it their duty to watch over that capital with unceasing care, and to add to it whenever it is practicable; and who have agreed to pay a fair, but not a speculative rent, for the lands they cultivate.

SECT. XI. Of Taxes and other Burdens which affect the Farmer.

4437. *Farmers are subjected to the payment of various taxes besides the rent paid to the landlord*; some of them imposed for local purposes, and others for the general expenses of the state. The real amount of such burdens, every careful tenant ought accurately to know, before he bargains for his lease. They may be classed under the following heads: parochial, national, and miscellaneous.

4438. *Parochial taxes* are for the support of the clergyman, for the maintenance of the poor, and in Scotland, for providing a parochial schoolmaster. The mode of supporting the clergy in England, by paying them a tenth part of the produce of the land in kind, is highly injurious to agriculture, and a bar to improvement. It is a great bar to improvement, because an improving farmer, one more enlightened or more spirited than his neighbors, would pay more tithe by means of his outlay and exertions, but it is not certain that he would likewise receive more profit. The produce would be more, but the expense would be greater. Nothing can be more obnoxious than a law, by which, when a person expends a large sum, either in reclaiming wastes, or augmenting the fertility of land already cultivated, he should be under the necessity of yielding up one-tenth of its produce to a person who has been liable to no share of the expense, who has run none of the risk, and who has sustained none of the labor attending the improvement. A commutation of tithe, therefore, instead of its being exacted in kind, would be one of the greatest benefits that could be conferred on agriculture; and there

is not the least difficulty in effecting it, by giving to the tithe-owner, either a proportion of the land, or by converting the tithe into a perpetual corn rent. Both these plans have been adopted in a variety of cases, by local acts in England, and they ought now to be enforced as a general system.

4439. *An assessment for the maintenance of the poor*, is another parochial burden, which is annually increasing, and which, if not speedily regulated upon proper principles, will inevitably absorb a very large proportion of rent in England. Indeed, there are instances, where between the years 1815 and 1822, it has absorbed the whole. This tax is the most dangerous of all for the farmer, on account of its fluctuation, and indeed, it may be said that it never falls but continually rises. During infancy, in sickness, and in old age, assistance may be necessary; but, as Malthus justly observes, the poor-laws hold out support to the vicious and idle, at the expense of the prudent and the industrious. These payments also destroy the spirit of independence, and those ideas of honest pride which stimulate a man to use his utmost exertions in support of himself and his family; and on its present footing, the boon is administered by the parish officers with caution and reluctance, and received by the poor with dissatisfaction and ingratitude.

4440. *In Scotland, the poor are in general maintained by voluntary contributions*; but when these are not found to be sufficient, the proprietors of the parish, with the clergyman and vestry, or kirk-session, are directed to make a list of the indigent persons in the parish, and then to impose an assessment for their relief, one half to be paid by the proprietors, and the other half by the tenantry.

4441. *The national burdens in general*, as the duties on houses and windows, and other assessed taxes; or assessments for the support of militia-men's wives and families, for the conveyance of vagrants, or the prosecution of felons, fall no heavier upon the farmer, than upon other classes of the community; but there is one impost which is severely felt by the arable farmer, namely, the tax on horses employed in husbandry. The inequality of that tax is strongly objected to; for lands, when pastured, and necessarily subject to the least expense, pay no part of it. The burden consequently falls exclusively on the lands in tillage, which, as a necessary consequence, must prevent the farmer from giving so high a rent on arable land as he would on grass land, in proportion to the produce.

4442. There are likewise various miscellaneous burdens affecting the farmer, as statute assessments for bridges, which are of such public utility, that moderate rates for their maintenance properly applied, cannot be objected to; statute labor on the highways; constable dues, which are seldom of much moment; charges of the churchwardens, including the repairs of the church; and in some populous parishes, there is sometimes a burial-ground tax. All these are paid by the occupiers. In some places also, there is a sewer's tax, chargeable on the landlords, where it is not otherwise settled by express contract. Adstriction to mills, however, is the severest burden where it exists, for not only is the expense of grinding double or treble what ought to be exacted, but the farmer is bound to carry his grain to be manufactured by a person, in whose skill or honesty he cannot always place any dependence.

4443. *As an example of the payments made by a farmer in England, whose rent is annually 500*l.* the following is submitted:*

Tithes are compounded for at	-	-	-	-	£100	0	0
Poor's assessment is 5 <i>s.</i> on the pound	-	-	-	-	125	0	0
Church assessment	-	-	-	-	6	5	0
Highway assessment	-	-	-	-	13	10	0
House tax and window tax	-	-	-	-	10	0	0
House tax and dog tax	-	-	-	-	7	10	0
Stamped receipts for these and other payments	-	-	-	-	1	15	0
The whole are very nearly 53 per cent., or					£264	0	0

4444. *The vexations to which farmers in England are subjected, from various uncertain burdens, operates as a premium to Scottish agriculture.* It is ingeniously and justly remarked, that physical circumstances are much more favorable to agriculture in England, than in her sister country; but these advantages are counteracted by the accumulation of moral evils, which might be removed if the legislature were to bestow on matters connected with the internal improvement of the country, and the means for promoting it, a portion of that attention, which it so frequently gives to the amelioration or improvement of our foreign possessions.

SECT. XII. *Of other Particulars requiring a Farmer's Attention, with a view to renting of Land.*

4445. *A variety of miscellaneous particulars* require consideration, before a prudent farmer will finally resolve to undertake the cultivation of a farm; as, the nature of the property on which the farm is situated; in particular, whether the estate is entailed, and to what extent the possessor of the estate is authorized to grant a lease; the character of the landlord, and in case of his decease, that of his family, and of those whom they are likely to consult; the real condition of the farm in regard to the enclosures, drainage, buildings, &c.; the crops it has usually produced, and the manner in which it has been managed for some

years preceding; the general state of the district, in regard to the price of labour and expense of living; the character of its inhabitants, in particular of the neighbors and laborers; and whether they are likely to promote or to discourage a improvement; the probability of subletting to advantage in case of not liking the finding a better bargain, or of death. The chances of settling one's family; as daughters, or of sons' making good marriages. The social state of the farmers, or would be considered one's neighbors; the number and tone of clergy, and law game, and the chances of disputes concerning it; the morals of the serving class places of worship, &c. It is evident, that in hardly any one instance can all the stances above enumerated be favorably combined. But the active and intelligent will not be discouraged by the obstacles he may have to surmount; but will endeavor, by exertion, industry, and perseverance, to overcome the difficulties unavoidably encounter.

CHAP. II.

Considerations respecting Himself, which a Farmer ought to keep in view in selecting a Farm.

4446. *Whoever intends to embrace farming as a profession, will be less likely with disappointment, if he previously examines a little into his own disposition and talents; and weighs his expectations against ordinary results. Nor is it less essential that he should estimate justly the extent to which his capital may be adequate, and keep regular accounts.*

SECT. I. *Of the personal Character and Expectations of a professional Farmer.*

4447. *Every one who proposes to farm with success, Professor Thaer observes, ought to unite energy and activity, to reflection, to experience, and to all necessary knowledge. It is true, he says, farming has long been considered as an occupation fit for a young man incapable for any other, and such have sometimes succeeded; but this has always been chiefly owing to a fortunate concurrence of circumstances, which it is not now very easy to meet with.*

4448. *The practice of agriculture consists of an infinite number of particular operations, each of which appears easy in itself; but is often for that very reason the more difficult to execute to the precise extent required; one operation so often interferes with another. To regulate them according to the given time and strength, and in such a way that none is neglected, or causes the neglect of others, requires at once a great deal of attention and activity, without inquietude; of promptitude without precipitation; of general views, and yet with an extreme attention to details.*

4449. *To casualties and accidents, no business is so much exposed as farming, and therefore to enjoy an ordinary degree of happiness, Professor Thaer considers it essential that the farmer possess a certain tranquillity of mind. This, he says, may either be the result of a natural phlegmatic habit of body, or of elevated views in religion, or philosophy. These will enable him to bear with every misfortune arising from adverse seasons, or the death of live stock; and only permit him to regret accidents which result from his own neglect.*

4450. *The expectations of profit and happiness which a young farmer has formed ought to be well weighed against the profits and happiness of farmers in general. However superior a farmer may consider his own talents and abilities, he may rest assured there are a number as skilful and adroit as himself, and just as likely to realize extraordinary advantages. Let none therefore engage in farming, thinking to make more money than other farmers similarly circumstanced with himself. If from a happy concurrence of circumstances he is more than usually successful, so much the better, and let him consider it as partly owing to good fortune as well as good farming; but never let him set out on the supposition of gaining extraordinary advantages with only ordinary means.*

4451. *The profits of farming are much exaggerated by people in general: but it may be asserted as an unquestionable fact, that no capital affords less profit than that employed in farming, except that sunk in landed property. This is the natural result both of the universality of the business and of its nature. Farming is every where practised, and every one thinks he may easily become a farmer; hence high rents, which necessarily lessen the profits on capital. From the nature of farming the capital employed is seldom returned. A tradesman may lay out and return his capital several times a year; but a farmer can never, generally speaking, grow more than one crop per annum. Suppose he succeeds in raising the best possible crops in his given circum-*

stances, still his profits have an absolute limit: for if an ordinary crop be as five, and the best that can be grown be as seven, all that the most fortunate concurrence of circumstances will give is not great and easily foreseen. It is hardly possible for a farmer, paying the market price for his land, to make much more than a living for himself and family. Those few who have exceeded this, will be found to have had leases at low rents; indulgent landlords; to have profited by accidental rises in the market or depreciation of currency; or to have become dealers in corn and cattle: and rarely indeed to have realized any thing considerable by mere good culture of a farm at the market price. Very different is the case of a tradesman, who, with the properties which we have mentioned as requisite for a good farmer, seldom fails of realizing an independency.

4452. *Many persons, chagrined with a city life, or tired of their profession, fancy they will find profit and happiness by retiring to the country and commencing farming.* Independently of the pecuniary losses attending such a change, none is more certain of being attended with disappointment to the generality of men. The activity required, and the privations that must be endured, are too painful to be submitted to; whilst the dull uniformity of a farmer's life to one accustomed to the bustle of cities, becomes intolerable to such as do not find resources in their fire-sides, their own minds, or, as Professor Thæer observes, in the study of nature.

4453. *The most likely persons to engage in farming with success, are the sons of farmers, or such others as have been regularly brought up to the practice, with their own hands, of every part of agriculture.* They must also have an inclination, as well as competent understanding of the theory or principles of the art. Books are to be found every where, from which the science of the art is to be obtained; and there are eminent farmers in the improved districts who take apprentices as pupils. In *The Husbandry of Scotland*, the case is mentioned of Walker, of Mellendean, an eminent farmer in Roxburghshire, who rents about 2866 acres of arable land, and is distinguished for his skill in agriculture, who takes young men under him as apprentices, who, instead of receiving wages, have uniformly paid him ten pounds each. Some of them remain with him two years, but the greater number only one. They eat in his kitchen, where they have always plenty of plain wholesome food. He takes none who are above living in that way, or who will not put their hand to every thing going forward on the farm. He has sometimes been offered ten times the above sum, to take in young gentlemen to eat and associate with his own family, but that he has uniformly declined. These young men have an opportunity of attending to every operation of husbandry, as practised on Walker's farm; and are taught to hold the plough, to sow, to build stacks, &c.

SECT. II. *Of the Capital required by the Farmer.*

4454. *The importance of capital in every branch of industry is universally acknowledged, and in none is it more requisite than in farming.* When there is any deficiency in that important particular, the farmer cannot derive an adequate profit from his exertions, as he would necessarily be frequently obliged to dispose of his crops for less than their value, to procure ready money; and it would restrain him from making advantageous purchases, when even the most favorable opportunities occurred. An industrious, frugal, and intelligent farmer, who is punctual in his payments, and hence in good credit, will strive with many difficulties, and get on with less money, than a man of a different character. But if he has not sufficient live stock to work his lands in the best manner, as well as to raise a sufficient quantity of manure; nor money to purchase the articles required for the farm, he must, under ordinary circumstances, live in a state of penury and hard labor; and the first unfavorable season, or other incidental misfortune, will probably sink him under the weight of his accumulated burdens. Farmers are too generally disposed to engage in larger farms than they have capital to stock and cultivate. This is a great error; for it makes many a person poor upon a large farm, who might live in comfort and acquire property, upon one of less extent. No tenant can be secure without a surplus at command, not only for defraying the common expenses of labor, but those which may happen from any unexpected circumstance. When a farmer, on the other hand, farms within his capital, he is enabled to embrace every favorable opportunity of buying when prices are low, and of selling when they are high.

4455. *The amount of capital required must depend upon a variety of circumstances; as whether it is necessary for the farmer to expend any sum in the erection, or in the repair of his farm-house and offices; what sum an in-coming tenant has to pay to his predecessor, for the straw of the crop, the dung left upon the farm, and other articles of similar nature; the condition of the farm at the commencement of the lease, and whether any sums must be laid out in drainage, enclosure, irrigation, levelling ridges, &c.; whether it is necessary to purchase lime, or other extraneous manures, and to what extent; on*

the period of entry, and the time at which the rent becomes payable, as this is sometimes exacted, before there is any return from the lands, out of the actual produce of which it ought to be paid; and, lastly, on its being a grazing, or an arable farm, or a mixture of both.

4456. *In pasture districts*, the common mode of estimating the amount of capital necessary, is according to the amount of the rent; and it is calculated, that in ordinary pastures, every farmer ought to have at his command, from three to five times the rent he has agreed to pay. But in the more fertile grazing districts, carrying stock worth from 20*l.* to 30*l.* and even upwards, per acre, (as is the case in many parts of England,) five rents are evidently insufficient. When prices are high, ten rents will frequently be required, by those who breed superior stock, and enter with spirit into that new field of speculation and enterprise.

4457. *The capital required by an arable farmer* varies, according to circumstances, from 5*l.* to 10*l.* or even 15*l.* per acre. An ignorant, timid, and penurious farmer lays out the least sum he can possibly contrive; and consequently he obtains the smallest produce or profit from his farm. These, however, will always increase, when accompanied by spirit and industry, in proportion to the capital employed, if judiciously expended. At the same time, attention and economy cannot be dispensed with. It is ill-judged to purchase a horse at forty guineas, if one worth thirty can execute the labor of the farm; or to lay out sums unnecessarily upon expensive harness, loaded with useless ornaments. Prudent farmers also, who have not a large capital at command, when they commence business, often purchase some horses still fit for labor, though past their prime, and some breeding mares, or colts; and in five or six years, they are fully supplied with good stock, and can sometimes sell their old horses without much loss. In every case, such shifts must be resorted to, where there is any deficiency of capital.

4458. *A mixture of arable and grass farming* is, on the whole, the most profitable method of farming. Independently of the advantages to be derived from the alternate husbandry (which are always considerable), the chances of profit are much more numerous from a varied system, than where one object is exclusively followed. Where this mixed mode of farming is practised, the farmer will frequently rely on the purchase of lean stock, instead of breeding his own; and derives great advantage from the quickness with which capital thus employed is returned. But, in that case, much must depend upon judicious selection. In general it may be said, that to stock a turnip-land arable farm, will require, at this time (1829), 5*l.* or 6*l.* and a clay-land farm from 7*l.* or 8*l.* per acre, according to circumstances.

4459. *This capital is necessarily divided into two parts.* The one is partly expended on implements, or stock of a more or less perishable nature, and partly vested in the soil; for this the farmer is entitled to a certain annual gain, adequate to replace, within a given number of years, the sum thus laid out. The other is employed in defraying the charges of labor, &c. as they occur throughout the year; the whole of which, with the interest, should be replaced by the yearly produce. These two branches of expense on a farm are the first to be attended to, both in order of time, and in magnitude of amount.

4460. *The most satisfactory statement hitherto given of the profit* derived from the expenditure of an adequate capital in arable farming, is that furnished by George Rennie, Esq. of Phantassie, in East Lothian. On a mixed soil of 702 English acres, he states the profits at 1*l.* 5*s.* per English acre, or about 14 per cent. on the capital employed. Rennie is one of the very first practical agriculturists in Scotland, and has been so successful as to purchase the farm which he occupies. (*Code, &c.* p. 70—73.)

CHAP. III.

On the Choice of Stock for a Farm.

4461. *The stocking of a farm* may be considered as including live stock, implements, servants, and seed. A considerable portion of a farmer's capital is employed in manures, tillages, labor, &c. but a farm being once engaged, the above are the only descriptions of stock which admit of a choice.

SECT. I. *Of the Choice of Live Stock.*

4462. *The animals required by a farmer* are of two kinds; such as are employed to assist in labor, and such as are used to convert the produce of the farm into food, or other disposable commodities.

SUBJECT. 1. *Live Stock for the Purposes of Labor.*

4463. *The animals of labor used in British farming* are exclusively the horse and the ox. Much difference of opinion formerly prevailed, as to which of these two animals should be preferred, and the preference has generally been given by speculative writers to the ox, and by practical farmers to the horse. Lord Kaimes in the last century, and Lord Somerville in the present, may be considered the principal advocates for the ox. To their arguments, and to all others, the following objections have been stated by the able author of the supplement to the 6th edition of *The Gentleman Farmer*; and they may be considered as conveying the sentiments, and according with the practice of all the best informed, and most extensive British farmers.

4464. *The first objection to oxen* is, that they are unfit for the various labors of modern husbandry, — for travelling on hard roads in particular, — for all distant carriages, — and generally for every kind of work which requires dispatch: and what sort of work often does not in this variable climate? A great part of a farmer's work is indeed carried on at home, and it may still be thought that this may be done by oxen, while one or more horse-teams are employed in carrying the produce to market, and bringing home manure and fuel. But it is unnecessary to appeal to the author of *The Wealth of Nations*, to prove the impracticability of this division of labor, unless upon very large farms; and even on these the advantages of such an arrangement are at best extremely problematical. The different kinds of farm-work do not proceed at the same time; but every season, and even every change of weather, demands the farmer's attention to some particular employment, rather than to others. When his teams are capable of performing every sort of work, he brings them all to bear for a time upon the most important labors of every season; and when that is dispatched, or interrupted by unfavorable weather, the less urgent branches are speedily executed by the same means. This is one cause, more important perhaps than any other, why oxen have ceased to be employed; for even ploughing, which they can perform better than any other kind of work, is scarcely ever going forward all the year; and for some months in winter, the weather often prevents it altogether.

4465. *Another objection* is, that an ox team capable of performing the work of two horses, even such kind of work as they can perform, consumes the produce of considerably more land than the horses. If this be the case, it is of no great importance, either to the farmer or the community, whether the land be under oats, or under herbage and roots. The only circumstance to be attended to here, is, the carcass of the ox: the value of this, in stating the consumption of produce, must be added to the value of his labor. He consumes, from his birth, till he goes to the shambles, the produce of a certain number of acres of land; the return he makes for this is so much beef, and so many years' labor. The consumption of produce must therefore be divided between these two articles. To find the share that should be allotted to each, the first thing is to ascertain how many acres of grass and roots would produce the same weight of beef from an ox, bred and reared for beef alone, and slaughtered at three or four years' old. What remains has been consumed in producing labor. The next thing is to compare this consumption with that of the horse, which produces nothing but labor. By this simple test, the question, viewing it upon a broad national ground, must evidently be determined. Every one may easily make such a calculation suited to the circumstances of his farm; none that could be offered would apply to every situation. But it will be found, that if even three oxen were able to do the work of two horses, the advantages in this point of view would still be on the side of the horses; and the first objection applies with undiminished force besides.

4466. *The money-price of the horse and ox*, it is evident, is merely a temporary and incidental circumstance, which depends upon the demand. A work ox may be got for less than half the price of a horse, because there is little or no demand for working oxen, while the demand for horses by manufacturers, commerce, pleasure, and war, enhance the price of farm-horses, as well as of the food they consume. Those who wish to see horses banished from all sorts of agricultural labor, would do well to consider where they are to be reared for the numerous wants of the other classes of society. Besides, if two oxen must be kept for doing the work of one horse, it ought to be foreseen, that though beef may be more abundant than at present, there will be a corresponding deficiency in the production of mutton and wool. A greater portion of the arable land of the country must be withdrawn from yielding the food of man directly, and kept under cattle crops, which, however necessary to a certain extent for preserving the fertility of the soil, do not return human food, on a comparison with corn-crops, in so great a proportion as that of one to six from any given extent of land of the same quality.

4467. *The demand for oxen is confined almost every where to the shambles*; and by the improvements of modern husbandry, they are brought to a state of profitable maturity at an early age. No difference in price at setting to work, — no increase of weight while working, — no saving on the value of the food consumed, can ever make it the interest of tillage farmers generally, to keep oxen as formerly, till they are eight or ten years old. They judiciously obtain the two products from different kinds of animals, each of them from the kind which is best fitted by nature to afford it, — the labor from the horse, and the beef alone from the ox. And though the price of the horse is almost wholly sunk at last, during the period of his labor he has been paying a part of it every year to a fund, which, before his usual term expires, becomes sufficiently large to indemnify his owner. The ox, on the other hand, is changed three or four times during the same period; and each of them gives nearly as large a carcass for the food of man, as if his days had been unprofitably prolonged in executing labor, from which he has been gradually exempted in Britain, in France, and in other countries, very nearly in proportion to the progress of correct systems of husbandry.

4468. *The description of horse* which a farmer ought to choose will depend chiefly on the soil of the farm, and partly also on the quantity of road-work. Stiff lands require obviously a heavier and more powerful breed than such as are light and hilly. In the latter case, two of the best breeds are the Clevelands and Clydesdale, or some local cross with these breeds. In general, it is not advisable to procure horses from a climate materially different from that where they are to remain; and therefore, for various reasons, a prudent farmer will look out for the best in his neighborhood. Often, however, he is

obliged to take the stock of his predecessor, and this he can only get rid of or improve to his mind by degrees. The farm-horses in most parts of England are much too cumbersome and heavy, and are more fitted for drawing heavy drays or waggons in towns, than for the quick step required in the operations of agriculture.

4469. *The objections of Davis of Longleat to the using of large heavy-heeled horses, in preference to the smart, the active, and the really useful breeds, merit particular attention.* In some situations, the steepness of the hills and the heaviness of the soil require more than ordinary strength; but in such cases, he maintains, that it would be better to add to the number of horses, than to increase their size. Great horses not only cost proportionably more at first than small ones, but require much more food, and of a better quality, to keep up their flesh. The Wiltshire carter also takes a pride in keeping them as fat as possible; and their food (which is generally barley) is given without stint. In many instances, indeed, the expense of keeping a fine team of horses, amounts nearly to the rent of the farm on which they are worked. They are purchased young when two years old colts, and sold at five or six years of age for the London drays and waggons. The expense of their maintenance is very seldom counterbalanced by the difference of price, more especially as such horses are gently worked when young, that they may attain their full size and beauty. In ploughing light soils, the strength of a dray-horse is not wanted; and in heavy soils, the weight of the animal does injury to the land.

SUBJECT. 2. Of the Choice of Live Stock for the Purposes of breeding or feeding.

4470. *The most desirable properties of live stock destined for food are considered in The Code of Agriculture, in respect to size, form, a tendency to grow, early maturity, hardiness of constitution, prolific properties, quality of flesh, a disposition to fatten, and lightness of offal.*

4471. *Before the improvements introduced by Bakewell, the value of an animal was entirely judged of by its bulk; and if a great size could be obtained, more regard was paid to the price the animal ultimately fetched, than to the cost of its food.* Of late, since breeders began to calculate with more precision, small or moderate-sized animals have been generally preferred, for the following reasons:—

4472. *Small-sized animals are more easily kept, they thrive on shorter herbage, they collect food where a large animal could hardly exist, and thence are more profitable.* Their meat is finer grained, produces richer gravy, has often a superior flavor, and is commonly more nicely marbled, or veined with fat, especially when they have been fed for two years. Large animals are not so well calculated for general consumption as the moderate-sized, particularly in hot weather; large animals poach pastures more than small ones; they are not so active, require more rest, collect their food with more labor, and will only consume the nicer and more delicate sorts of plants. Small cows of the true dairy breeds give proportionably more milk than large ones. Small cattle may be fattened solely on grass of even moderate quality; whereas the large require the richest pastures, or to be stall-fed, the expense of which exhausts the profit of the farmer. It is much easier to procure well-shaped and kindly-feeding stock of a small size than of a large one. Small-sized cattle may be kept by many persons who cannot afford either to purchase or to maintain large ones, and by whom the loss, if any accident should happen to them, can be more easily borne. The small-sized sell better; for a butcher, from a conviction that, in proportion to their respective dimensions, there is a greater superficies of valuable parts in a small than in a large animal, will give more money for two oxen of twelve stone each per quarter, than for one of twenty-four stone.

4473. *In favor of the large-sized, it is, on the other hand, contended, that without debating whether from their birth till they are slaughtered the large or the small one eats most for its size, yet on the whole the large one will pay the grazier or farmer who fattens him as well for its food; that though some large oxen are coarse-grained, yet where attention is paid to the breed (as is the case with the Herefordshire), the large ox is as delicate food as the small one; that if the small-sized are better calculated for the consumption of private families, of villages, or of small towns, yet that large cattle are fitter for the markets of great towns, and in particular of the metropolis; that were the flesh of the small-sized ox better when fresh, yet the meat of the large-sized is unquestionably more calculated for salting, a most essential object in a maritime and commercial country, for the thicker the beef the better it will retain its juices when salted, and the fitter it is for long voyages; that the hide of the large ox is of very great consequence in various manufactures; that large stock are in general distinguished by a greater quietness of disposition; that where the pastures are good, cattle and sheep will increase in size, without any particular attention on the part of the breeder; large animals are therefore naturally the proper stock for such pastures; that the art of fattening cattle, and even sheep, with oil-cake, being much improved and extended, the advantage of that practice would be of less consequence, unless large oxen were bred, as small oxen*

can be fattened with grass and turnips, as well as oil-cake; and, lastly, that large oxen are better calculated for working than small ones, two large oxen being equal to four small ones in the plough or the cart.

4474. *Such are the arguments generally made use of on both sides of the question; from which it appears that much must depend upon pastures, taste, mode of consumption, markets, &c. and that both sides have their advantages.* The intelligent breeder, however, (unless his pastures are of a nature peculiarly forcing,) will naturally prefer a moderate size in the stock he rears. Davis, of Longleat, one of the ablest agriculturists England has produced, has given some useful observations on the subject of size. He laments that the attempts which have been made to improve the breeds of cows, horses, and sheep, have proceeded too much upon the principle of enlarging the size of the animal; whereas, in general, the only real improvement has been made in the pig, and that was by reducing its size, and introducing a kind that will live hardier, and come to greater perfection at an earlier age.

4475. *Though it is extremely desirable to bring the shape of cattle to as much perfection as possible, yet profit and utility ought not to be sacrificed for mere beauty which may please the eye but will not fill the pocket, and which, depending much upon caprice, must be often changing.* In regard to form, the most experienced breeders seem to concur in the following particulars: — That the form or shape should be compact, so that no part of the animal should be disproportioned to the other parts, and the whole distinguished by a general fulness and rotundity of shape; that the chest should be broad, for no animal whose chest is narrow can easily be made fat; that the carcase should be deep and straight; that the belly should be of a moderate size; for when it is more capacious than common in young animals it shews a diseased state, and in older ones it is considered a proof that the animal will not return in flesh, in milk, or in labor, the value of the extra quantity of fruit which it consumes; that the legs should be short, for the long-limbed individuals of the same family or race are found to be the least hardy, and the most difficult to rear or to fatten; and that the head, the bones, and other parts of inferior value, should be as small as is consistent with strength, and with the other properties which the animal ought to possess. In animals bred for the shambles, the form must likewise be such as to contain the greatest possible proportion of the finer compared to the coarser and less valuable parts of the animal. This, by selection, may be attained, and thus the wishes of the consumer may be gratified. As to the broad loins and full hips, which are considered as a point of excellence in particular breeds, it is evident that the old narrow and thin make, required improvement; but the alteration is now carried to a faulty excess, and often occasions great difficulty and danger in calving.

4476. *The form of animals* has fortunately attracted the attention of an eminent surgeon, Henry Cline, Esq. of London, whose doctrines we have already laid down at length (1995.), and the substance of which is: — That the external form is only an indication of the internal structure; that the lungs of an animal is the first object to be attended to, for on their size and soundness the health and strength of an animal principally depend; that the external indications of the size of the lungs are the form and size of the chest, and its breadth in particular; that the head should be small, as by this the birth is facilitated; as it affords other advantages in feeding, &c. and as it generally indicates that the animal is of a good breed; that the length of the neck should be in proportion to the size of the animal, that it may collect its food with ease; and that the muscles and tendons should be large, by which an animal is enabled to travel with greater facility. It was formerly the practice to estimate the value of animals by the size of their bones. A large bone was considered to be a great merit; and a fine-boned animal always implied great size. It is now known that this doctrine was carried too far. The strength of an animal does not depend upon the bones, but on the muscles; and when the bones are disproportionably large, it indicates, in Cline's opinion, an imperfection in the organs of nutrition. Bakewell strongly insisted on the advantage of small bones; and the celebrated John Hunter declared that small bones were generally attended with corpulence in all the various subjects he had an opportunity of examining. A small bone, however, being heavier and more substantial, requires as much nourishment as a hollow one with a larger circumference.

4477. Among the *qualities* for which thorough-bred cattle and sheep are distinguished, that of being good growers, and having a good length of frame, is not the least essential. The meaning of which is, that the animal should not only be of a strong and healthy constitution, but speedily should grow to a proper size. As specimens of rapid growth, a steer of three years old, when well fed, will weigh from 80 to 90 or 100 stone, 14 lb. to the stone; and a two-year old Leicester wedder, from 25 to 28 lb. per quarter, immediately after his second fleece is taken from him. Animals having the property of growing, are usually straight in their back and belly; their shoulders well thrown back, and their belly rather light than otherwise. At the same time, a gauntness and paucity

of intestines should be guarded against, as a most material defect, indicating a very unthrifty animal. Being too light of bone, as it is termed, is also a great fault. A good grower, or hardy animal, has always a middling sized bone. A bull distinguished for getting good growers, is inestimable; but one whose progeny takes an unnatural or gigantic size, ought to be avoided.

4478. *Arriving soon at perfection*, not only in point of growth or size, but in respect of fatness, is a material object for the farmer, as his profit must in a great measure depend upon it. Where animals, bred for the carcass merely, become fat at an early age, they not only return sooner the price of their food, with profit to the feeder, but in general also, a greater value for their consumption, than slow-feeding animals. This desirable property greatly depends on a mild and docile disposition; and as this docility of temper is much owing to the manner in which the animal is brought up, attention to insure them early to be familiar, cannot be too much recommended. A tamed breed also has other advantages. It is not so apt to injure fences, or to break into adjacent fields; consequently it is less liable to accidents, and can be reared, supported, and fattened, at less expense. The property of early maturity, in a populous country, where the consumption of meat is great, is extremely beneficial to the public, as it evidently tends to furnish greater supplies to the market; and this propensity to fatten at an early age, is a sure proof, that an animal will fatten speedily at a later period of his life.

4479. In the wilder and bleaker parts of a country, *the possession of a hardy and healthy constitution*, is a most valuable property in stock. Where the surface is barren, and the climate rigorous, it is essential that the stock bred and maintained there, should be able to endure the severities and vicissitudes of the weather, as well as scarcity of food, hard work, or any other circumstance in its treatment, that might subject a more delicate breed to injury. In this respect, different kinds of stock greatly vary; and it is a matter of much consequence, to select, for different situations, cattle with constitutions suitable to the place where they are to be kept. It is a popular belief, that dark colors are indications of hardiness. In mountain breeds of cattle, a rough pile is reckoned a desirable property, more especially when they are to be kept out all winter. It enables them to face the storm, instead of shrinking from it. Hardy breeds are exempted from various diseases, such as having yellow fat, also being blackfleshed, defects so injurious to stock.

4480. *The prolific quality of a breed* is a matter deserving attention. The females of some breeds both bear more frequently than usual, and also have frequently more than one at a birth. This property runs more strikingly in sub-varieties, or individual families; and though partly owing to something in the habits of animals, and partly to their previous good or bad treatment, yet in some degree seems to depend upon the seasons, some years being more distinguished for twins than others. In breeding, not only the numbers, but the sex of the offspring, in some cases, seem to depend upon the female parent. Two cows produced fourteen females each in fifteen years, though the bull was changed every year. It is singular, that when they produced a bull calf, it was in the same year. Under similar circumstances, a great number of males have been produced by the same cow in succession, but not to the same extent.

4481. Breeds are likewise distinguished by *the quality of their flesh*. In some kinds it is coarse, hard, and fibrous; in others of a finer grain or texture. In some breeds also, the flavor of the meat is superior; the gravy they produce, instead of being white and insipid, is high colored, well flavored, and rich; and the fat is intermixed among the fibres of the muscles, giving the meat a streaked, or marbled appearance. Breeds whose flesh have these properties, are peculiarly valuable. Hence two animals of nearly the same degree of fatness and weight, and who could be fed at nearly the same expense to the husbandman, will sell at very different prices, merely from the known character of their meat.

4482. *A disposition to fatten* is a great object in animals destined for the shambles. Some animals possess this property during the whole progress of their lives, while in others, it only takes place at a more advanced period, when they have attained their full growth, and are furnished at the same time with a suitable supply of food. There are in this respect other distinctions: most sorts of cattle and sheep, which have been bred in hilly countries, will become fat on low land pastures, on which the more refined breeds would barely live; some animals take on fat very quickly, when the proper food has been supplied, and some individuals have been found, even in the same breed, which have, in a given time, consumed the least proportional weight of the same kind of food, yet have become fat at the quickest rate. Even in the human race, with little food, some will grow immoderately corpulent. It is probably from internal conformation, that this property of rapid fattening is derived.

4483. *The advantages and disadvantages of fattening cattle and sheep*, at least to the extent frequently practised at present, are points that have of late attracted much public

attention. But any controversy on that subject can only arise from want of proper discrimination. Fat meat is unquestionably more nourishing than lean, though to digest this oily matter, there are required, on account of its difficult solubility, a good bile, much saliva, and a strong stomach; consequently none, excepting those who are in the most vigorous state of health, or who are employed in hard labor, can properly digest it. Though fat meat, however, is unfit for general consumption, yet experiments in the art of fattening animals, are likely to promote useful discoveries; and though, in the course of trying a number of experiments, errors and excesses may be committed, yet on the whole, advantage may be derived from the knowledge thus to be obtained. As the bone also gains but little in the fattening animal, and the other offal becomes proportionably less, as the animal becomes more fat, the public has not sustained much loss by over-fatted animals. To kill even hogs till they are thoroughly fat, is exceeding bad economy. An ox or cow, though the little flesh it has may be of good quality, yet presents, when lean, little but skin and bone; and if slaughtered in that state would neither indemnify the owner for the expense of breeding and maintaining it, nor benefit the public. A coarse and heavy-fleshed ox, which would require a very long time, and much good food to fatten, may be slaughtered with most advantage while rather lean. It is not, however, so much the extent of fat, as the want of a sufficient quantity of lean flesh, of which the consumer complains; for it cannot be doubted, that the lean flesh of a fat animal is superior in quality, and contains more nourishment, than any other meat.

4484. *Handling well.* The graziers and butchers in various parts of the kingdom have recourse to the band, and the feeling of the skin, or cellular membrane, for ascertaining a disposition to fatten; and since Bakewell directed the public attention so much to breeding, that practice has become more generally known. Handling cannot easily be defined, and can only be learnt by experience. The skin and flesh of cattle, when handled, should feel soft to the touch, somewhat resembling that of a mole, but with a little more resistance to the finger. A soft and mellow skin must be more pliable, and more easily stretched out, to receive any extraordinary quantity of fat and muscle, than a thick or tough one. The rigid-skinned animal must therefore always be the most difficult to fatten. In a good sheep, the skin is not only soft and mellow, but in some degree elastic. Neither cattle nor sheep can be reckoned good, whatever their shapes may be, unless they are first-rate handlers. The improved short-horned breed, besides their mellowness of skin, are likewise distinguished by softness and silkiness of hair. Too great a length, however, ought not to be aimed at, since it is not easy, in that case, to preserve a due proportion in the appearance of the animal, without which it cannot be considered perfect.

4485. *Lightness of offal.* An animal solely bred for the shambles, should have as little offal, or parts of inferior value, as possible (consistently with the health of the animal), and consequently a greater proportion of meat applicable as food for man. This, therefore, the skilful farmer will also keep in view in selecting his species of stock. (*Code, &c.*)

SECT. II. *Of the Choice of Agricultural Implements, Seeds and Plants.*

4486. *The variety and excellence of agricultural implements* is so great that the prudent farmer in regard to that, as well as in every other branch of his art, must study economy. He should not incur an unnecessary expense in buying them, nor in purchasing more than are essentially requisite, and can be profitably used. This maxim ought to be more especially attended to by young improvers, who are often tempted, under the specious idea of diminishing labor, and saving expense, to buy a superfluous quantity of implements, which they afterwards find are of little use. (*Coventry's Disc.* p. 47.) It is remarked by an intelligent author on matters of husbandry, that a great diversity of implements, as they are more rarely used, prove in general a source of vexation and disappointment, rather than of satisfaction to the farmer.

4487. *The different implements required by the farmer* are: those of tillage, for drilling or sowing corn; for reaping corn; for harvesting corn; for threshing and cleaning corn; for mowing and harvesting hay; of conveyance; for draining; for harnessing stock; for rolling land; for the dairy; and, for miscellaneous purposes.

4488. *In purchasing implements*, the following rules are to be observed: they should be simple in their construction, both that their uses may be more easily understood, and that any common workman may be able to repair them, when they get out of order; the materials should be of a durable nature, that the labor may be less liable to interruption from their accidental failure; their form should be firm and compact, that they may not be injured by jolts and shaking; and that they may be more safely worked by country laborers, who are but little accustomed to the use of delicate tools. In the larger machines, symmetry, and lightness of shape, ought to be particularly attended to: for a heavy carriage, like a great horse, is worn out by its own weight, nearly as much as by what he carries. The wood should be cut up and placed in a position the best calcu-

lated to resist pressure; and mortises, so likely to weaken the wood, should, as much as possible, be avoided; at the same time, implements should be made as light as is consistent with the strength that is necessary. Their price should be such, that farmers in moderate circumstances can afford to buy them; yet for the sake of a low price, the judicious farmer will not purchase articles, either of a flimsy fabric, or a faulty form; and implements ought to be suited to the nature of the country, whether hilly or level, and more especially to the quality of the soil; for those which are calculated for light land, will not answer equally well in soils that are heavy and adhesive. (*Code.*)

4489. *In the choice of seed corn* regard must be had to procure it from a suitable soil and climate, and of a suitable variety. A change from one soil to another of a different quality, is generally found advantageous; but this is not always the case as to climate. Thus some of the varieties of oats, as the Angus oat, which answers well in most parts of Scotland, is found not to fill in the ear, but to shrivel up after blossoming in the south of England. In like manner, the woolley-chafed white wheats of Essex and Kent, rot in the ear, when grown in the moist climate of Lancashire. In settling on a farm in a country with which the farmer is little acquainted, he will often find it advisable to select the best seed he can find in the neighborhood, and probably to resift it and free it from the seeds of weeds and imperfect grains. Particular care is requisite in selecting the seed of the bean and pea, as no crop depends more on the variety being suited to the soil and climate. Thus, on hot gravelly soils in the south, the late grey pea would produce little haulm and no pulse; but the early varieties, or the pearl pea, will produce a fair proportion of both.

4490. The only *small seeds* the farmer has to sow on a large scale, are the different varieties of turnip, and probably the mangoldwurzel and carrot. No expense or trouble should be spared to procure the best turnip seed; as if that is either mixed by impregnation with other varieties of the Brassica tribe, or has been raised from a degenerate small bulbed parentage, the progeny will never come to any size. The same may be said of carrot or mangold seed, raised from small misshapen roots. Even rape seed should be raised from the strongest and largest bulbed plants, as these always produce a stronger progeny.

4491. *Of the plants* which the farmer has to choose for stock, the chief is the potatoe, and every one knows that no circumstances in the soil, climate, or culture will compensate for planting a bad sort. The potatoe requires a climate rather humid as otherwise, and rather moderate and equable in temperature than hot: hence the best crops are found in Lancashire, Dumfriesshire, and Ayrshire in Britain, and in Ireland where the climate is every where moist. Excellently-flavored potatoes are also grown on mossy lands in most parts of the country. The prudent farmer will be particularly careful in choosing this description of plant stock, and also in changing it frequently so as to ensure prolificacy and flavor.

SECT. III. *Of the Choice of Servants.*

4492. *On the moral and professional character of his servants* much of the comfort of the farmer depends, and every one who has farmed near large towns, and at a distance from them, knows how great the difference is in every description of laborers. The servants required in farmeries are the bailiff or head ploughman, common ploughmen, shepherds, laborers of all work, herdsmen, and women. Sometimes apprentices and pupils are taken; but their labor is not often to be much depended on.

4493. *A bailiff* is required only in the largest description of farms, occupied by a professional farmer; and is not often required to act as market man. In general young men are preferred, who look forward to higher situations, as gentlemen's bailiffs or land stewards. Most farmers require only a head ploughman, who works the best pair of horses and takes the lead of, and sets the example to, the other ploughmen in every description of work.

4494. *Ploughmen* should, if possible, be yearly servants, unless they are married and have families. Weekly or occasional ploughmen are found comparatively unsteady; they are continually wandering from one master to another, and are very precarious supports of a tillage farm: for they may quit their service at the most inconvenient time, unless bribed by higher wages; and the farmer may thus lose the benefit of the finest part of the season. Where day laborers, however, are married, they are more to be depended upon, than unmarried domestic servants, more especially when the laborer has a family, which ties him down to regular industry.

4495. *The mode of hiring servants* at what are called public statutes, so general in many parts of England, is justly reprobated, as having a tendency to vitiate their minds, enabling them to get places without reference to character, exposing good servants to be corrupted by the bad, promoting dissipation, and causing a cessation of country business for some days, and an awkwardness in it for some time afterwards. When hiring servants, it would be extremely important, if possible, to get rid of any injurious perquisites, which

are often prejudicial to the interests of the master, without being of any advantage to the servant. For instance, in Yorkshire and in other districts, it is a custom to give farm servants liquor, both morning and evening, whatever is the nature and urgency of the work. Nothing can be more absurd than permitting a ploughman to stop for half an hour in a winter day to drink ale, while his horses are neglected and shivering with cold.

4496. *The following plan of maintaining the kinds or ploughmen in the best cultivated districts in Scotland*, is found by experience to be greatly superior to any other mode hitherto adopted.

4497. *Proper houses* are built for the farm servants, contiguous to every farmstead. This gives them an opportunity of settling in life, and greatly tends to promote their future welfare. Thus also the farmer has his people at all times within reach, for carrying on his business.

4498. *The farm servants*, when married, receive the greater part of their wages in the produce of the soil, which gives them an interest in the prosperity of the concern in which they are employed, and in a manner obliges them to eat and drink comfortably; while young men often starve themselves in order to save money for drinking or clothes; in either of which cases they are deficient in the requisite animal strength. At least, under this mode of payment, they are certain of being supplied with the necessities of life, and a rise of prices does not affect them; whereas, when their wages are paid in money, they are exposed to many temptations of spending it, which their circumstances can ill afford; and during a rise of prices they are sometimes reduced to considerable difficulties. From the adoption of an opposite system, habits of sobriety and economy, so conspicuous among the farm servants of Scotland, and the advantages of which cannot be too highly appreciated, have arisen and still prevail in these districts.

4499. A most important branch of this system is, that *almost every married man has a cow*, of a moderate size, kept for him by the farmer all the year round. This is a boon of great utility to his family. The prospect of enjoying this advantage has an excellent effect upon the morals of young unmarried servants, who, in general, make it a point to lay up as much of their yearly wages as will enable them to purchase a cow and furniture for a house when they enter into the married state. These savings, under different circumstances, would most probably have been spent in dissipation.

4500. They have also *several other perquisites*, as a piece of ground for potatoes and flax, (about one-eighth part of an acre for each); liberty to keep a pig, half a dozen hens, and bees; their fuel is carried home to them; they receive a small allowance in money per journey, when sent from home with corn, or for coals or lime; and during the harvest, they are maintained by the farmer, that they may be always at hand.

4501. *There are no where to be met with, more active, respectable, and conscientious servants, than those who are kept according to this system.* There is hardly an instance of their soliciting relief from the public. They rear numerous families, who are trained to industry, and knowledge in the operations of agriculture, and whose assistance in weeding the crops, &c. is of considerable service to the farmer. They become attached to the farm, take an interest in its prosperity, and seldom think of removing from it. Under this system, every great farm is a species of little colony, of which the farmer is the resident governor. Nor, on the whole, can there be a more gratifying spectacle, than to see a large estate, under the direction of an intelligent landlord, or of an agent competent to the task of managing it to advantage; where the farms are of a proper size; where they are occupied by industrious and skilful tenants, anxious to promote, in consequence of the leases they enjoy, the improvement of the land in their possession; and where the cultivation is carried on by a number of married servants, enjoying a fair competence, and rearing large families, sufficient, not only to replace themselves, but also from their surplus population, to supply the demand, and even the waste, of the other industrious classes of the community. Such a system, there is reason to believe, is brought to a higher degree of perfection, and carried to a greater extent, in the more improved districts of Scotland, than perhaps any other country in Europe. (*Code, &c.*)

4502. *A shepherd* is of course only requisite on sheep farms; and no description of farm servant is required to be so steady and attentive. At the lambing season much of the farmer's property is in his hands, and depends on his unwearied exertions early and late. Such servants should be well paid and comfortably treated.

4503. *The laborers* required on a farm are few; in general, one for field operations, as hedge and ditch work, roads, the garden, cleaning out furrows, &c.; and another for attending to the cattle, pigs, and straw-yard, killing sheep and pigs when required, &c. will be sufficient. Both will assist in harvest, hay-time, threshing, filling dung, &c. These men are much better servants when married and hired by the year, than when accidental day laborers.

4504. *The female servants* required in farmery are casual, as hay-makers, turnip hoeers, &c.; or yearly, as house, dairy, and poultry maids. Much depends on the steady-

ness of the first class, and it is in general better to select them from the families of the married servants, by which means their conduct and conversation is observable by their parents and relations. A skilful dairymaid is a most valuable servant, and it is well when the cattle-keeper is her husband; both may live in the farmer's house (provided they have no children), and the man may act as groom to the master's horse and chaise, and assist in brewing, butchery, &c. In the cheese districts, men often milk the cows and manage the whole process of the dairy; but females are surely much better calculated for a business of so domestic a nature, and where so much depends on cleanliness.

4505. *Farmers' apprentices* are not common, but parish boys are so disposed of in some parts of the west of England, and might be so generally. They are said to make the best and steadiest servants; and indeed, the remaining in one situation, and under one good master for a fixed period, say not less than three years, must have a great tendency to fix the character and morals of youth in every line or condition of life.

4506. *Apprentices intended for farmers* are generally young men who have received a tolerable education beforehand, and have attained to manhood or nearly so. These pay a premium, and are regularly instructed in the operations of farming. We have already alluded to the example of Walker, who considers such apprentices, notwithstanding the care required to instruct them, rather useful than otherwise. (*Hush. of Scot.* vol. ii. p. 106.)

4507. *To train ploughmen to habits of activity and diligence* is of great importance. In some districts they are proverbial for the slowness of their step, which they teach their horses, whereas these animals, if accustomed to it, would move with as much ease to themselves, in a quick, as in a slow pace. Hence their ploughs seldom go above two miles in an hour, and sometimes even less; whereas where the soil is light and sandy, they might go at the rate of three miles and a half. Farmers are greater sufferers than they imagine, by this habitual indolence of their workmen, which extends from the plough to all their other employments, for it makes a very important difference in the expense of labor. Where the land however is stiff, and deep ploughing is necessary, the operation ought not to be too much hurried. (*Code.*)

CHAP. IV.

Of the general Management of a Farm.

4508. The importance of an *orderly systematic mode of managing* every concern is sufficiently obvious. The points which chiefly demand a farmer's attention are the accounts of money transactions, the management of servants, and the regulation of labor.

SECT. I. *Of keeping Accounts.*

4509. It is a maxim of the Dutch, that "*no one is ever ruined who keeps good accounts*," which are said, in *The Code of Agriculture*, to be not so common among farmers as they ought to be; persons employed in other professions being generally much more attentive and correct. Among gentlemen farmers there is often a systematic regularity in all their proceedings, and their pages of debtor and creditor, of expense and profit are as strictly kept as those of any banking-house in the metropolis. But with the generality of farmers, the case is widely different. It rarely happens, that books are kept by them in a minute and regular manner; and the accounts of a farmer, occupying even a large estate, and consequently employing a great capital, are seldom deemed of sufficient importance to merit a share of attention, equal to that bestowed by a tradesman, on a concern of not one-twentieth part of the value. There is certainly some difficulty in keeping accurate accounts respecting the profit and loss of so uncertain and complicated a business as the one carried on by the farmer, which depends so much on the weather, the state of the markets, and other circumstances not under his control; but the great bulk of farming transactions is settled at the moment, that is to say, the article is delivered, and the money instantly paid, so that little more is necessary than to record these properly. In regard to the expenses laid out on the farm, an accurate account of them is perfectly practicable, and ought to be regularly attended to by every prudent and industrious occupier. By examining these, a farmer is enabled to ascertain the nature and the extent of the expense he has incurred, in the various operations of agriculture; and to discover what particular measures, or what general system, contributes to profit, or occasions loss. The principle of economy may thus be introduced into the management of a farm, and the lessening of expense effected, which is every day becoming of greater importance, as bearing a higher proportion to the produce of the farm.

4510. *To record pecuniary transactions* is not the only object to be attended to in the accounts of a farmer. It is necessary to have an annual account of the live stock, and

of their value at the time; of the quantity of hay unconsumed; of the grain in store, or in the stack-yard; and of the implements and other articles in which the capital is invested. An account, detailing the expense and return of each field, according to its productive contents, is likewise wanted, without which it is impossible to calculate the advantage of different rotations, the most beneficial mode of managing the farm; or the improvements of which it is susceptible. Besides the obvious advantages of enabling a man to understand his own affairs, and to avoid being cheated, it has a moral effect upon the farmer of the greatest consequence, however small his dealings may be. Experience shews that men situated like small farmers (who are their own masters, and yet have very little capital to manage or to lose), are very apt to contract habits of irregularity, procrastination, and indolence. They persuade themselves that a thing may be as well done to-morrow as to-day, and the result is, that the thing is not done till it is too late, and then hastily and imperfectly. Now nothing can be conceived better adapted to check this disposition, than a determination to keep regular accounts. The very consciousness that a man has to make entries in his books of every thing that he does, keeps his attention alive to what he is to do; and the act of making those entries, is the best possible training to produce active and pains-taking habits.

4511. *The accounts of gentlemen farmers or of the bailiffs they employ, it is said in The Code, cannot be too minute; but in regard to rent-paying farmers the great objects are to have them short and distinct. For this purpose a journal for business transactions, such as purchases, sales, agreements, hirings, and other real or prospective arrangements; a cash-book and a ledger, will, in our opinion, be sufficient, with the aid of memorandum books. But for greater accuracy, or rather for more curious farmers, the following models are given in The Code of Agriculture. The gentleman farmer and bailiff will find various descriptions of "Farmer's account books" among the booksellers. One in very general use is Harding's Farmer's Account Book.*

4512.

*Weekly Journal of Transactions, from**to*

	State of Weather.			
	Bar.	Ther.	Wind.	Rain.
Monday.				
Tuesday.				
Wednes.				
Thursday.				
Friday.				
Saturday.				
Sunday.				

4513.

*Weekly State of Labor, from**to*

Names of Men and Horses.	Mon.	Tues.	Wed.	Thurs.	Friday.	Satur.	No. of Days.	Rate per Day.	Total.		
									£.	s.	d.
Daily Laborers - -											
Farm Servants - -											
Horses - - - -											
Task Work - - -											
Work by Tradesmen -											

4514.

Cash Account.

[illegible]

4515.

Management of Arable Land.

[illegible]

4516.

Management of Pasture Land.

[illegible]

4517.

Management of Woodland.

Quantity of Barks.										Underwood.						Timber Sold.																	
No. of Years.		What Year.		No. of Barks.		At per Day.		Amount.		Quantity.		Price.		Amount.		Cost Cutting down.		Quan. sold.		Amount.		Sort.		Quantity.		Price.		Amount.		Post to Bark & Timber.		Underwood.	
														</																			

4518.

Account of Crops.

Sort.	Threshed.			Bought.			Sold.			Sown.			Consumed.			Where, and by whom consumed.			Where sown.			Ground.				
	Quarters. Bushels.			Quarters. Bushels.			Quarters. Bushels.			Quarters. Bushels.			Quarters. Bushels.			Sort.	By whom.	Bushels. Pecks.		No. of Field.	Quarters. Bushels.			Bushels. Pecks.		
Wheat - - -																										
Barley - - -																										
Oats } - - -																										
Hay - - - -																										
Potatoes - -																										

4519.

Dairy Account of Milk, Butter, and Cheese.

		Sunday.		Mon.		Tues.		Wed.		Thurs.		Friday.		Sat.		Total Price.		Amount.		
		Qts.	Pts.	Qts.	Pts.	Qts.	Pts.	Qts.	Pts.	Qts.	Pts.	Qts.	Pts.	Qts.	Pts.	s.	d.	L.	s.	d.
Milk.	Milked - - -																			
	Made into Butter & Cheese }																			
	Consumed - - -																			
Butter.	Made - - - -		lbs.		lbs.		lbs.		lbs.		lbs.		lbs.		lbs.					
	Sold - - - -																			
	Consumed - - -																			
Cheese.	Made - - - -																			
	Sold - - - -																			
	Consumed - - -																			

4520.

Stock Account.

Increase and Decrease of Live Stock.							What Part of the Farm occupied by the Cattle.					
Description.			Increase by		Decrease by		Total.	Date when sent in.	When taken out.	Number and Description of Cattle.	No. of the Field.	Nature of the Crop in the Field.
		No.	Pur- chase.	Birth.	Death.	Sale.						
Sheep.	Rams											
	Ewes	Spaniard										
	Wethers											
	R. Lambs	Spaniards										
	E. Lambs	Ditto										
Cattle.	Bulls											
	Cows											
	Oxen											
	Heifers											
	B. Calves											
Pigs.	C. Calves											
	Boars											
	Sows											
	Barrows											
	Pigs											
Horses.	Horses											
	Mares											
	Colts											
Poultry and Eggs.	Turkies											
	Poultz											
	Fowls											
	Chickens											
	Geese											
	Goosings											
	Ducks											
	Ducklings											
Pigeons												
Eggs												

4521. *The account books for a common farmer*, may be a cash-book for all receipts and payments, specifying each; a ledger for accounts with dealers and tradesmen; and a stock book for taking an inventory and valuation of stock, crop, manures, tillages, (and every thing that a tenant could dispose of or be paid for on quitting his farm) once a year. Farming may be carried on with the greatest accuracy and safety, as to money matters, by means of the above books, and a few pocket memorandum books for laborers' time, jobs, &c. With the exception of a time-book, such as we have before described (3140.), we should never require more, even from a proprietor's bailiff; to many of whom the nine forms just given (4512.) would only puzzle; — to some we have known them lead to the greatest errors and confusion. No form of books, or mode of procedure, will enable a farmer to know whether he is losing or gaining but that of taking stock. Valuing produce consumed, and crediting the farm with it, is in practice nonsense; and the same may be said of various items in most of these nine forms. An approximation to the profits yielded by particular crops or modes of management, may always be made by the farmer or bailiff from recollection. There can never be a field on the farm, which he cannot at the time of reaping the crop, tell how often it has been ploughed; when manured, what the seed was worth, &c.; and from these and the other usual data, he can easily make out a Dr. and Cr. account, sufficient for all practical purposes.

SECT. II. *Management of Servants.*

4522. In order that servants may be able and willing to do their work, it is necessary that they be well fed, comfortably lodged, and decently clothed. The last requisite may be

left to their own judgment, allowing an adequate sum or wages for that purpose: but the feeding and clothing of farm servants, and especially of single men, requires to be seen to by the master. Without this attention on the part of the latter, the sum allowed for these purposes will either be in part boarded up, or idly spent, in either case lessening the physical strength, and often injuring the moral faculties of the man.

4523. *In former times*, the servants lived at the same table with their masters, and that is still the practice in those districts where the farms are small. On moderate-sized, and on large farms, they are usually sent to a separate table; but of late a custom has been introduced of putting them on board-wages. This is a most pernicious practice; which often leads them to the ale-house, corrupts their morals, and injures their health. It is a better plan, with a view of lessening trouble, to board them with the bailiff; but it is still more desirable for the farmer, to have them under his own eye, that he may attend to their moral conduct. He will find much more useful assistance, from the decent and the orderly, than from the idle and the profligate.

4524. *The best mode of managing yearly married servants*, whether ploughmen or laborers, we conceive to be that already referred to (4496.) as practised in Northumberland, and other northern counties. Marshal (*Review of Bailey's Northumberland*) calls it a remnant of feudal times; but certainly, if it is so, it appears one of those remains which should be carefully preserved. We may challenge the empire to produce servants and farm operations equal to those where this system is adopted. The great excellence of the system consists on its being founded in the comfort of the servant.

4525. *The permanent laborers* on a farm ought to be treated in the same manner as the ploughmen; and indeed it is much to be wished, for the sake both of humanity and morality, that all married laborers, who live in the country, should have gardens attached to their cottages, if not a cow kept, and a pig, and fowls, in the manner of the Scottish ploughmen. Some valuable observations on this subject will be found in *The Husbandry of Scotland*, and *The Code of Agriculture*.

4526. *Temporary laborers*, or such as are engaged for hay-making, reaping, turnip-hoeing, &c. are for the most part beyond the control of the farmer as to their living and lodging. It is a good practice, however, where hay-making and reaping is performed by the day, to feed the operators, and to lodge such of them as have not homes in the neighborhood, on the premises; providing them with a dry loft, and warm blankets. Piece or job-work, however, is now becoming so very general, in all farm operations performed by occasional laborers, that attention to these particulars becomes unnecessary, and the farmer's chief business is to see that the work be properly done.

4527. *A day's work* of a country laborer is ten hours during the spring, summer, and autumn quarters. Farmers, however, are not at all uniform in their hours of working during these periods. Some begin at five o'clock, rest three hours at mid-day, during the more violent heat of the sun, and fill up their day's work, by beginning again at one o'clock, and ending at six in the evening. Others begin at six, and end at six, allowing half an hour at breakfast, and an hour at dinner. But although these be the ordinary hours, both for servants and laborers, during the more busy seasons of the year, yet neither of them will scruple to work either sooner or later, when occasion requires. In regard to the winter months, the hours of labor are from the dawn of morning, as long as it is light, with the allowance of about half an hour at mid-day for dinner.

4528. *That the rate of labor* must in a great measure depend upon the price of grain, is a general principle. In England, the value of a peck of wheat, and in Scotland, of a peck of oatmeal, (being the principal articles of subsistence of the lower orders of the people in the two countries,) were long accounted an equivalent to the daily pay of a laborer. In both countries, however, the price of potatoes has, of late years, had a considerable influence in the rate of labor; and in England, the effects of the poor laws have tended to keep down that rate below the increased price of provisions, and thus have deranged the natural progress of things. It has been ascertained, that a man, his wife, and from two to three children, if wheat is their habitual food, will require ten gallons weekly. When they live on bread, hard working people ought to have the best kind, as that will furnish the most nutrition. How then could a laborer and his family exist, upon wages of from 6s. to 9s. per week, when wheat is from 8s. to 10s. or 12s. per bushel? The difference is compensated by the poor-rates, a most exceptionable mode of making up the deficiency; for labor would otherwise have found its own level, and the laborer would have obtained the price of a bushel and a half of wheat weekly.

4529. *In Scotland*, the rate of labor has increased beyond the price of provisions. Prior to 1792, the average price of a peck of oatmeal was 1s. 1d. and the average price of a day's labor in summer, 1s. 1½d. which nearly corresponded with the principle above stated: but the average price of a peck of oatmeal, in 1810, was 1s. 3½d. whilst the average price of a day's labor was 1s. 10½d. which shews, in a most satisfactory manner, the very great improvement that has taken place, in the lot of the laboring classes, in that part of the united kingdom. (*Gen. Rep. vol. iii. p. 262.*)

4530. *The practice of giving laborers grain, &c. at a cheap rate*, was adopted by George III. who carried on farming operations to a considerable extent, allowing his laborers flour at a fixed price, whatever wheat might sell for. This benevolent system has been practised by several gentlemen farmers, some of whom have allowed bread, and others a daily quantity of milk, at moderate prices. The same system is general in several of the western counties, as in Dorset, Devon, and Cornwall, where the laborers have a standing supply of bread-corn; of wheat at 6s. and of barley at 3s. per bushel.

4531. *In the wages of labor, as well as in every thing else, moderation is desirable.* It is remarked, that high wages have a tendency to throw laborers out of employment, as farmers in general, and even small proprietors, are unable to give such wages; hence they are obliged to carry on their work with fewer hands, or to postpone improvements, which otherwise they would have undertaken. Nor is that all. The laborers themselves suffer by it, and so does the public. In the fens of Lincolnshire, wages have risen in harvest time, from 3s. 6d. to 7s. nay to 10s. 6d. per day, every day's hiring taking place at a certain spot, where masters, whose work is in haste, outbid each other, and thus raise the wages to that exorbitant height. The consequence was, that the laborers got drunk, would not work above four days out of the six, dissipated their money, hurt their constitutions, contracted indolent and vicious habits, and their labor was lost to the community, for at least one-third part of the time, at a most important crisis. (*Code, &c.*)

4532. *Most descriptions of country labor, performed without the aid of horses, may be let by the job.* Farey, in his excellent *Report of Derbyshire*, informs us, that besides all ordinary labor, the late John Billingsley, of Ashwick Grove, in Somersetshire, let his ploughing, harrowing, rolling, sowing, turning of corn when cut, hay-making, &c. by the acre, and from which he found great advantages, even where his own oxen and horses were used, by the takers of the work. Whether we regard dispatch, economy, perfection of rural works, or the bettering of the condition of the laborers therein, nothing will contribute so much to all these, as a general system of letting works at fair and truly apportioned prices, according to the degree of labor and skill required, in each kind of work. Few persons have doubted that dispatch and economy are attainable by this method, but those who have indolently or improperly gone about the letting of their labor, have uniformly complained of its being slovenly done, and of the proneness of the men to cheat, when so employed. These last are to be expected in all modes of employment, and can only be counteracted, or made to disappear, by competent knowledge and due vigilance in the employer, or his agents and foremen, who ought to study and understand the time and degree of exertion and skill, as well as the best methods, in all their minutiae of performing all the various works they have to let. At first sight, these might seem to be very difficult and unattainable qualifications in farmers' bailiffs, or foremen, but it is nevertheless certain, that a proper system and perseverance will soon overcome these difficulties. One of the first requisites is, the keeping of accurate and methodical day-accounts of all men employed; and, on the measuring up and calculating of every job of work, to register how much has been earned per day, and never to attempt abatement of the amount, should this even greatly exceed the ordinary day's pay of the country; but let this experience gained, operate in fixing the price of the next job of the same work, in order to lessen the earnings by degrees, of fully competent and industrious men, to $1\frac{1}{2}$ to $2\frac{1}{2}$ times the ordinary wages when working by the day.

4533. *Select the men into small gangs, according to their abilities and industry,* and always set the best gang about any new kind of work, or one whose prices want regulating, and encourage these by liberal prices at first, and gradually lower them, and by degrees introduce the other gangs to work with or near to them at the same kind of work. On the discovery of any material slight of, or deceptions in the work, at the time of measuring it, more than their proportionate values should be deducted for them, and a separate job made to one of the best gangs of men, for completing or altering it: by which means shame is made to operate, with loss of earnings, in favor of greater skill, attention, and honesty in future. When the necessity occurs of employing even the best men by the day, let the periods be as short as possible, and the prices considerably below job earnings, and contrive, by the offer of a desirable job to follow, to make it their interest and wish to dispatch the work that is necessary to be done by the day, in order to get again to piece-work. The men being thus induced to study and contrive the readiest and best methods of performing every part of their labor, and of expending their time, the work will unquestionably be better done than by the thoughtless drones who usually work by the day. And that these are the true methods of bettering the condition of the laborers, Malthus has ably shewn in theory, and all those who have adopted and persevered in them, have seen the same in practice. (*Farey's Derbyshire*, vol. iii. 192.)

SECT. III. Of the Arrangement of Farm Labor.

4534. *The importance of order and system* we have already insisted on (§127.), and the subject can hardly be too often repeated. To conduct an extensive farm well, is not a matter of trivial moment, or to the management of which every one is competent. Much may be effected by capital, skill, and industry; but even these will not always

ensure success, without judicious arrangement. With it, a farm furnishes an uninterrupted succession of useful labor during all the seasons of the year; and the most is made that circumstances will admit of, by regularly employing the laboring persons and cattle, at such works as are likely to be the most profitable. Under such a system, it is hardly to be credited how little time is lost, either of the men or horses, in the course of a whole year. This is a great object; for each horse may be estimated at three shillings per day, and each man at two shillings. Every day, therefore, in which a man and horse are unemployed, occasions the loss of at least five shillings to the husbandman.

4535. *As the foundation of a proper arrangement, it is necessary to have a plan of the farm, or at least a list of the fields or parcels of land into which it is divided, describing their productive extent, the quality of the soil, the preceding crops, the cultivation given to each, and the species and quantity of manure they have severally received. The future treatment of each field, for a succession of years, may then be resolved on with more probability of success. With the assistance of such a statement, every autumn an arrangement of crops for the ensuing year ought to be made out; classing the fields or pieces of land, according to the purposes for which they are respectively intended. The number of acres allotted for arable land, meadow, or pasture, will thus be ascertained. It will not then be difficult to anticipate what number of horses and laborers will be required during the season for the fields in culture, nor the live stock that will be necessary for the pasture land. The works of summer and harvest will likewise be foreseen, and proper hands engaged in due time to perform them.*

4536. *A farmer should have constantly in view a judicious rotation of crops, according to the nature and quality of his soil, and should arrange the quantity and succession of labor accordingly. Team labor, when frost and bad weather do not intervene, should be arranged for some months; and hand labor, for some weeks, according to the season of the year. "A general memorandum list of business to be done," may therefore be useful, that nothing may escape the memory, and that the most requisite work may be brought forward first, if suitable to the state of the weather. In this way, the labor will go on regularly, and without confusion, while by a proper attention, either a distribution of labor, or an occasional consolidation of it, may be applied to every part of the farm.*

4537. *As general rules, connected with the arrangement, and the successful management of a farm, the following are particularly to be recommended.*

4538. *The farmer ought to rise early, and see that others do so. In the winter season, breakfast should be taken by candle light, for by this means an hour is gained, which many farmers indolently lose; though six hours in a week are nearly equal to the working part of a winter day. This is a material object, where a number of servants are employed. It is also particularly necessary for farmers to insist on the punctual performance of their orders.*

4539. *The whole farm should be regularly inspected, and not only every field examined, but every beast seen, at least once a day, either by the occupier, or by some intelligent servant.*

4540. *In a considerable farm, it is of the utmost consequence to have servants specially appropriated for each of the most important departments of labor; for there is often a great loss of time, where persons are frequently changing their employments. Besides, where the division of labor is introduced, work is executed not only more expeditiously, but also much better, in consequence of the same hands being constantly employed in one particular department. For that purpose, the ploughmen ought never to be employed in manual labor, but regularly kept at work with their horses, when the weather will admit of it.*

4541. *To arrange the operation of ploughing, according to the soils cultivated, is an object of essential importance. On many farms there are fields, which are soon rendered unfit to be ploughed, either by much rain, or by severe drought. In such cases, the prudent farmer, before the wet season commences, should plough such land as is in the greatest danger of being injured by too much wet; and before the dry period of the year sets in, he should till such land as is in the greatest danger of being rendered unfit for ploughing by too much drought. The season between seed time and winter may be well occupied in ploughing soils intended to be sown with beans, oats, barley, and other spring crops, by means of the grubber (2533.). On farms where these rules are attended to, there is always some land in a proper condition to be ploughed; and there is never any necessity, either for delaying the work, or performing it improperly.*

4542. *Every means should be thought of to diminish labor, or to increase its power. For instance, by proper arrangement, five horses may do as much labor as six perform, according to the usual mode of employing them. One horse may be employed in carting turnips during winter, or in other necessary farm work at other seasons, without the necessity of reducing the number of ploughs. When driving dung from the farm-yard,*

three carts may be used, one always filling in the yard, another going to the field, and a third returning; the leading horse of the empty cart ought then to be unyoked, and put to the full one. In the same manner, while one pair of horses are preparing the land for sowing turnips, the other three horses may be employed in carrying the dung to the land, either with two or three carts, as the situation of the ground may happen to require. By extending the same management to other farm operations, a considerable saving of labor may be effected.

4543. *Previously to engaging in a work, whether of ordinary practice, or of intended improvement, the best consideration of which the farmer is capable ought to be given to it, till he is satisfied that it is advisable for him to attempt it. When begun, he ought to proceed in it with much attention and perseverance, until he has given it a fair trial. It is a main object, in carrying on improvements, not to attempt too much at once; and never to begin a work without a probability of being able to finish it in due season.*

4544. *By the adoption of these rules, every farmer will be master of his time, so that every thing required to be done, will be performed at the proper moment; and not delayed till the season and opportunity have been lost. The impediments arising from bad weather, sick servants, or the occasional and necessary absence of the master, will, in that case, be of little consequence, nor embarrass the operations to be carried on; and the occupier will not be prevented from attending to even the smallest concerns connected with his business, on the aggregate of which his prosperity depends.*

SECT. IV. *Of domestic Management and personal Expenses.*

4545. *On domestic affairs, a hint may suffice. Young farmers beginning house-keeping, like most others in similar circumstances, are apt to sink too great a proportion of their capital in furniture, and furnishing riding-horses, carriages, &c.; and sometimes to live up to, or even beyond, their income. We do not mean that farmers should not live as well as other men of the same property; but merely that all beginners should live within their income. Even in the marketing expenses care is requisite; and the prudent farmer will do well, every penny or sixpence he lays out, to reckon up in his mind what that sum per day would amount to in a year. The amount will often astonish him, and lead to economy, and where practicable, retrenchment. Saving, as Franklin has inculcated, is the only certain way of accumulating money.*

4546. *In regard to housekeeping, it is observed in The Code of Agriculture, that the safest plan is, not to suffer it to exceed a certain sum for bought articles weekly. An annual sum should be allotted for clothing, and the personal expenses of the farmer, his wife, and children, which ought not to be exceeded. The whole allotted expense should be considerably within the probable receipts; and if possible one-eighth of the income annually received, should be laid up for contingencies, or expended in extra improvements on the farm.*

BOOK VI.

OF THE CULTURE OF FARM LANDS.

4547. *The business of farming consists of the culture of vegetables, and the treatment or culture of animals; in practice these are generally carried on together, but may be more conveniently treated of apart. In this Book, therefore, we confine ourselves to the culture of vegetables, and shall consider in succession the general processes of culture; the culture of corn and pulse; of roots and leaves; of herbage plants; of grasses; and of manufactory plants.*

CHAP. I.

Of the general Processes common to Farm Lands.

4548. *Among general processes, those which merit particular notice in this place, are the rotation of crops, the working of fallows, and the management of manures. The theory of these processes has been already given in treating of soils and manures (PART II. BOOK III.); and it therefore only remains to detail their application to practice under different circumstances.*

SECT. I. *Of the Rotations of Crops suitable to different Descriptions of Soils.*

4549. *The proper distribution of crops, and a plan for their succession, is one of the first subjects to which a farmer newly entered on a farm requires to direct his attention. The kind of crops to be raised are determined in a great measure by the climate, soil, and demand; and the quantity of each, by the value, demand, and the adjustment of farm labor.*

4550. *In the adjustment of farm labor, the great art is to divide it as equally as possible throughout the year. Thus it would not answer in any situation to sow exclusively autumn crops, as wheat or rye; nor only spring corns, as oats or barley; for by so doing all the labor of seed-time would come on at once, and the same of harvest work, while the rest of the year there would be little to do on the farm. But by sowing a portion of each of these and other crops, the labor both of seed-time and harvest is divided and rendered easier, and more likely to be done well and in season. But this point is so obvious as not to require elucidation.*

4551. *The succession or rotation of crops, is a point on which the profits of the farmer depend more than on any other. It is remarked by Arthur Young, that the agricultural writers, previously to the middle of the eighteenth century, paid little or no attention to it. They recite, he says, courses good, bad, and execrable, in the same tone; as matters not open to praise or censure, and unconnected with any principles that could throw light on the arrangement of fields. The first writer who assigned due importance to the subject of rotations seems to have been the Rev. Adam Dickson, in his *Treatise on Agriculture*, published in Edinburgh, in 1777; and soon afterwards Lord Kaim, in his *Gentleman Farmer*, illustrates the importance of the subject; both writers were probably led to it by observing the effects of the Norfolk husbandry, then beginning to be introduced to Berwickshire. But whatever may have been the little attention paid to this subject by former writers, the importance of the subject of rotations, and the rule founded on the principles already laid down, that culmiferous crops ripening their seeds should not be repeated without the intervention of pulse roots, herbage, or fallow, is now "recognised in the practice and writings of all judicious cultivators, more generally perhaps than any other." (*Edit. of Farmer's Mag.*)*

4552. *The system of rotations is adopted for every soil, though no particular rotation can be given for any one soil which will answer in all cases, as something depends on climate, and something also on the kind of produce for which there is the greatest market demand. But wherever the system of rotations is followed, and the several processes of labor which belong to it properly executed, land will rarely get into a foul and exhausted state; or, at least if foul and exhausted under a judicious rotation, "matters would be much worse were any other system followed."*

4553. *The particular crops which enter into a system of rotation must obviously be such as are suited to the soil and climate, though as the valuable author so often quoted observes, "they will be somewhat varied by local circumstances; such as the proximity of towns and villages, where there is a greater demand for turnips, potatoes, hay, &c. than in thinly-peopled districts. In general, beans and clover, with rye-grass, are interposed between corn crops on clayey soils; and turnips, potatoes, and clover and rye-grass, on dry loams and sands, or what are technically known by the name of turnip soils. A variety of other plants, such as pease, tares, cabbages, and carrots, occupy a part, though commonly but a small part, of that division of a farm which is allotted to green crops. This order of succession is called the system of *alternate husbandry*, and on rich soils, or such as have access to abundance of putrescent manure, it is certainly the most productive of all others, both in food for man and for the inferior animals. One half of a farm is, in this course, always under some of the different species of *cereal gramina*, and the other half under pulse, roots, cultivated herbage, or plain fallow.*

4554. *But the greater part of the arable land of Britain cannot be maintained in a fertile state under this management; and sandy soils, even though highly manured, soon become too incohesive under a course of constant tillage. It, therefore, becomes necessary to leave that division or break that carries cultivated herbage, to be pastured for two years or more, according to the degree of its consistency and fertility; and all the fields of a farm are treated thus in their turn, if they require it. This is called the system of *convertible husbandry*, a regular change being constantly going on from aration to pasturage, and vice versa.*

4555. *Not to repeat the same kind of crop at too short intervals is another rule with regard to the succession of crops. Whatever may be the cause, whether it is to be sought for in the nature of the soil, or of the plants themselves, experience clearly proves the advantages of introducing a diversity of species into every course of cropping. When land is pastured several years before it is brought again under the plough, there may be less need for adhering steadily to this rule; but the degeneracy of wheat and other corn crops recurring upon the same land every second year for a long period, has been very gene-*

rally acknowledged. It is the same with what are called green crops; beans and pease, potatoes, turnips, and, in an especial manner, red clover, become all of them much less productive, and much more liable to disease, when they come into the course, upon the same land, every second, third, or fourth year. But what the interval ought to be has not yet been determined, and probably cannot (from the great number of years that experiments must be continued to give any certain result) be determined, until the component parts of soils, and particularly the sort of vegetable nourishment which each species of plant extracts from the soil, have been more fully investigated.

4556. *A change of the variety*, as well as of the species, and even of the plants of the same variety, is found to be attended with advantage; and in the latter case, or a change of seed, the species and variety being the same, the practice is almost universal. It is well known, that of two parcels of wheat, for instance, as much alike in quality as possible, the one, which had grown on a soil differing much from that on which it is to be sown, will yield a better produce than the other that grew in the same, or a similar soil and climate. The farmers of Scotland, accordingly, find that wheat from the south, even though it be not, as it usually is, better than their own, is a very advantageous change; and oats and other grain, brought from a clayey to a sandy soil, other things being equal, are more productive than such as have grown on sandy soil. (*Supp. Encyc. Brit. art. Agr. 144.*)

4557. *The following are examples of rotations suited to different soils*, as given in Brown's excellent *Treatise on Rural Affairs*. The basis of every rotation, he says, "we hold to be either a bare summer fallow, or a fallow on which drilled turnips are cultivated, and its conclusion to be with the crops taken in the year preceding a return of fallow or drilled turnips, when of course a new rotation commences.

4558. *Rotation for strong deep lands*. According to this rotation, wheat and drilled beans are the crops to be cultivated, though clover and rye-grass may be taken for one year in place of beans, should such a variety be viewed as more eligible. The rotation begins with summer fallow, because it is only on strong deep lands that it can be profitably practised; and it may go on for any length of time, or so long as the land can be kept clean, though it ought to stop the moment that the land gets into a contrary condition. A considerable quantity of manure is required to go on successfully; perhaps dung should be given to each bean crop; and if this crop is drilled, and attentively horse-hoed, the rotation may turn out to be one of the most profitable that can be exercised.

4559. *Rotation for loams and clays*. Where it may not be advisable to carry the first rotation into execution, a different one can be practised; according to which labor will be more divided, and the usual grains more generally cultivated; as, for instance,

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| 1. Fallow, with dung. | 4. Barley. | 7. Beans drilled and horse-hoed. |
| 2. Wheat. | 5. Clover and rye-grass. | 8. Wheat. |
| 3. Beans, drilled and horse-hoed. | 6. Oats or wheat. | |

This rotation is excellently calculated to insure an abundant return through the whole of it, provided dung is administered upon the clover stubble. Without this supply, the rotation would be crippled, and inferior crops of course produced in the concluding years.

4560. *Rotation for clays and loams of an inferior description*. This rotation is calculated for soils of an inferior description to those already treated of.

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| 1. Fallow, with dung. | 3. Clover and rye-grass. | 5. Beans, drilled and horse-hoed. |
| 2. Wheat. | 4. Oats. | 6. Wheat. |

According to this rotation, the rules of good husbandry are studiously practised, while the sequence is obviously calculated to keep the land in good order, and in such a condition as to ensure crops of the greatest value. If manure is bestowed, either upon the clover-stubble, or before the beans are sown, the rotation is one of the best that can be devised for the soils mentioned.

4561. *Rotation for thin clays*. On thin clays, gentle husbandry is indispensably necessary, otherwise the soil may be exhausted, and the produce unequal to the expense of cultivation. Soils of this description will not improve much while under grass; but, unless an additional stock of manure can be procured, there is a necessity of refreshing them in that way, even though the produce should, in the mean time, be comparatively of small value. The following rotation is not an improper one.

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| 1. Fallow, with dung. | 3. Grass pastured, but not too early eaten. | 5. Grass. |
| 2. Wheat. | 4. Grass. | 6. Oats. |

This rotation may be shortened or lengthened, according to circumstances, but should never extend further in point of ploughing, than when dung can be given to the fallow-break. This is the keystone of the whole; and if it is neglected, the rotation is rendered useless.

4562. Rotation for peat earth soils. These are not friendly to wheat, unless aided by a quantity of calcareous matter. Taking them in a general point of view, it is not advisable to cultivate wheat, but a crop of oats may almost be depended upon, provided the previous management has been judiciously executed. If the subsoil of peat earth lands be retentive of moisture, the process ought to commence with a bare summer fallow; but if such are incumbent on free and open bottoms, a crop of turnips may be substituted for fallow; according to which method, the surface will get a body which naturally it did not possess. Grass, on such soils, must always occupy a great space of every rotation, because physical circumstances render regular cropping utterly impracticable.

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| 1. Fallow, or turnips with dung. | 3. Clover, and a considerable quantity of perennial rye-grass. | circumstances permit the land to be broken up, when oats are to be repeated. |
| 2. Oats of an early variety. | 4. Pasture for several years, till | |

4563. Rotation for light soils. These are easily managed, though to procure a full return of the profit which they are capable of yielding, requires generally as much attention as is necessary in the management of those of a stronger description. Upon light soils, a bare summer fallow is seldom called for, as cleanliness may be preserved by growing turnips, and other leguminous articles. Grass also is of eminent advantage upon such soils, often yielding a greater profit than what is afforded by culmiferous crops.

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| 1. Turnips. | 3. Clover and rye-grass. |
| 2. Spring wheat, or barley. | 4. Oats or wheat. |

This is a fashionable rotation; but it may be doubted whether a continuance of it for any considerable period is advisable, because both turnips and clover are found to fall off when repeated so often as once in four years. Perhaps the rotation would be greatly improved were it extended to eight years, whilst the ground, by such an extension, would be kept fresh and constantly in good condition. As for instance, were seeds for pasture sown in the second year, the ground kept three years under grass, broke up for oats in the sixth year, drilled with beans and pease in the seventh, and sown with wheat in the eighth; the rotation would then be complete, because it included every branch of husbandry, and admitted a variety in management generally agreeable to the soil, and always favorable to the interest of cultivators. The rotation may also consist of six crops, were the land kept only one year in grass, though few situations admit of so much cropping, unless additional manure is within reach.

4564. Rotation for sandy soils. These, when properly manured, are well adapted to turnips, though it rarely happens that wheat can be cultivated on them with advantage, unless they are dressed with alluvial compost, marl, clay, or some such substances as will give a body or strength to them, which they do not naturally possess. Barley, oats, and rye, the latter especially, are, however, sure crops on sands, and in favorable seasons will return greater profit than can be obtained from wheat.

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| 1. Turnips, consumed on the ground. | 3. Grass. |
| 2. Barley. | 4. Rye or oats. |

By keeping the land three years in grass, the rotation would be extended to six years, a measure highly advisable.

4565. These examples are sufficient to illustrate the subject of improved rotations; but as the best general schemes may be sometimes momentarily deviated from with advantage, the same able author adds, that "cross cropping, in some cases, may perhaps be justifiable in practice; as, for instance, we have seen wheat taken after oats with great success, when these oats had followed a clover crop on rich soil; but, after all, as a general measure, that mode of cropping cannot be recommended. We have heard of another rotation, which comes almost under the like predicament, though, as the test of experience has not yet been applied, a decisive opinion cannot be pronounced upon its merits. This rotation begins with a bare fallow, and is carried on with wheat, grass for one or more years, oats, and wheat, where it ends. Its supporters maintain that beans are an uncertain crop, and cultivated at great expense; and that in no other way will corn, in equal quantity and of equal value, be cultivated at so little expense, as according to the plan mentioned. That the expense of cultivation is much lessened, we acknowledge, because no more than seven ploughings are given through the whole rotation; but whether the crops will be of equal value, and whether the ground will be preserved in equally good condition, are points which remain to be ascertained by experience." (*Brown on Rural Affairs.*)

4566. As a general guide to devising rotations on clay soils, it may be observed, that winter or autumn sown crops are to be preferred to such as are put in in spring. Spring ploughing on such soils is a hazardous business, and not to be practised where it can possibly be avoided. Except in the case of drilled beans, there is not the slightest necessity for ploughing clays in the spring months; but as land intended to carry beans ought to be early ploughed, so that the benefit of frost may be obtained, and as the seed furrow is an ebb one, rarely exceeding four inches in deepness, the hazard of spring

ploughing for this article is not of much consequence. Ploughing with a view to clean soils of the description under consideration, has little effect, unless given in the summer months. This renders summer fallow indispensably necessary, and without this radical process, none of the heavy and wet soils can be suitably managed, or preserved in a good condition.

4567. *To adopt a judicious rotation of cropping for every soil*, requires a degree of judgment in the farmer, which can only be gathered from observation and experience. The old rotations were calculated to wear out the soil, and to render it unproductive. To take wheat, barley, and oats in succession, a practice very common thirty years ago, was sufficient to impoverish the best of land, while it put little into the pockets of the farmer; but the modern rotations, such as those which we have described, are founded on principles which ensure a full return from the soil, without lessening its value, or impoverishing its condition. Much depends, however, upon the manner in which the different processes are executed, for the best arranged rotation may be of no avail, if the processes belonging to it are imperfectly and unseasonably executed. (See 2158.)

SECT. II. *Of the working of Fallows.*

4568. *The practice of fallowing*, as we have seen in our historical view of Greek and Roman agriculture, has existed from the earliest ages; and the theory of its beneficial effects we have endeavored to explain. (2125.) The Romans with their agriculture introduced fallows in every part of Europe, and two crops, succeeded either *ar's* fallow, or by leaving the land to rest for two or more years, became the rotation on all soils and under all circumstances. This mode of cultivating arable land is still the most universal in Europe; its prevalence till very lately in Britain created a powerful aversion to naked fallows, by which a crop was lost every year they occurred, and called forth numerous attempts to shew that they were unnecessary, consequently an immense public loss. This anti-fallowing mania, as it has been called, was chiefly supported by Arthur Young, Nathaniel Kent, and others, members or correspondents of the Board of Agriculture; it was at its greatest height about the beginning of the present century, but has now spent its force, and after exhausting all the arguments on both sides, as an able author has observed, "the practice does not appear to give way, but rather to extend."

4569. *The expediency or in expediency of pulverising and cleaning the soil by a bare fallow*, is a question that can be determined only by experience, and not by argument. No reasons, however ingenious, for the omission of this practice, can bring conviction to the mind of a farmer, who, in spite of all his exertions, finds, at the end of six or eight years, that his land is full of weeds, sour and comparatively unproductive. Drilled and horse hoed green crops, though cultivated with advantage on almost every soil, are probably in general unprofitable as a substitute for fallow, and after a time altogether inefficient. It is not because turnips, cabbages, &c. will not grow in such soils, that a fallow is resorted to, but because, taking a course of years, the value of the successive crops is found to be so much greater, even though an unproductive year is interposed, as to induce a preference to fallowing. Horse-hoed crops, of beans in particular, postpone the recurrence of fallow, but in few situations can ever exclude it altogether. On the other hand, the instances that have been adduced, of a profitable succession of crops on soils of this description, without the intervention of a fallow, are so well authenticated, that it would be extremely rash to assert that it can in no case be dispensed with on clay soils. Instances of this kind are to be found in several parts of Young's *Annals of Agriculture*; and a very notable one, on Greg's farm of Colea, in Hertfordshire, is accurately detailed in the sixth volume of *The Communications to the Board of Agriculture*.

4570. *The principal causes of this extraordinary difference among men of great experience*, may probably be found in the quality of the soil, or in the nature of the climate, or in both. Nothing is more vague than the names by which soils are known in different districts. Greg's farm, in particular, though the soil is denominated "heavy arable land," and "very heavy land," is found so suitable to turnips, that a sixth part of it is always under that crop, and these are consumed on the ground by sheep; a system of management, which every farmer must know to be altogether impracticable on the wet tenacious clays of other districts. It may indeed be laid down as a criterion for determining the question, that wherever this management can be profitably adopted, fallow, as a regular branch of the course, must be not less absurd than it is injurious, both to the cultivator and to the public. It is probable, therefore, that, in debating this point, the opposite parties are not agreed about the quality of the soil; and in particular, about its property of absorbing and retaining moisture, so different in soils, that in common language have the same denomination.

4571. *Another cause of difference must be found in the climate*. It is well known, that a great deal more rain falls on the west than on the east coast of Britain; and that between the northern and southern counties there is at least a month or six weeks' difference in the maturation of the crops. Though the soil therefore be as nearly as possible similar in quality and surface, the period in which it is accessible to agricultural operations must vary accordingly. Thus, in the south-eastern counties of the island, where the crops may be all cut down, and almost all carried home by the end of August, much may be done in cleansing and pulverising the soil, during the months of September and October, while the farmers of the north are exclusively employed in harvest work, which is frequently not finished by the beginning of November.

In some districts in the south of England, wheat is rarely sown before December; whereas in the north, and still more in Scotland, if it cannot be got completed by the end of October, it must commonly be delayed till spring, or oats or barley be taken in place of wheat. It does not then seem of any utility to enter further into this controversy, which every skillful cultivator must determine for himself. All the crops, and all the modes of management which have been purposed as a substitute for fallow, are well known to such men, and would unquestionably have been generally adopted long ago, if, upon a careful consideration of the advantages and disadvantages on both sides, a bare fallow was found to be unprofitable in a course of years. The reader who wishes to examine the question fully may consult, among many others, the following: — Young's *Annals of Agriculture*, and his writings generally; Hunter's *Georgical Essays*; Dickson's *Practical Agriculture*; Sir H. Davy's *Agricultural Chemistry*; *The Agricultural Chemistry of Chaptal*; Brown's *Treatise on Rural Affairs*; *The County Reports*; and *The General Report of Scotland*.

4572. *Fallows unnecessary on friable soils.* However necessary the periodical recurrence of fallow may be on retentive clays, its warmest advocates do not recommend it on turnip soils, or on any friable loams incumbent on a porous subsoil; nor is it in any case necessary every third year, according to the practice of some districts. On the best cultivated lands it seldom returns oftener than once in six or eight years, and in favorable situations for obtaining an extra supply of manure, it may be advantageously dispensed with for a still longer period. (*Suppl. to Encyc. Brit. art. Agr.*)

4573. *The operation of fallowing*, as commonly practised in England, is a very different and comparatively useless, or at least ineffectual operation, to what it ought to be. In most places the first furrow is not given till the spring, or even till the month of May or June; or, if it is given earlier, the second is not given till after midsummer, and on the third the wheat is sown. Land may rest under this system of management; but to clean it from weeds, or pulverise it, or give it the benefits of aeration and heat, is impossible. The farmer in some cases purposely delays ploughing his fallows for the sake of the scanty bite the couch and weeds afford to his sheep; and for the same reason having ploughed once, he delays the second ploughing. It is not to be wondered at, that under such a system the theoretical agriculturist should have taken a rooted aversion to what are thus erroneously termed fallows. The practice of the best farmers of the northern counties is very different, and that practice we shall here detail.

4574. *A proper fallow* invariably commences after harvest; the land intended to be fallowed getting one ploughing, which ought to be as deep as the soil will admit, even though a little of the till or subsoil is brought up. This both tends to deepen the cultivated, or manured soil, as the fresh accession of hitherto uncultivated earth becomes afterwards incorporated with the former manured soil, and greatly facilitates the separation of the roots of weeds during the ensuing fallow process, by detaching them completely from any connection with the fast subsoil. This autumnal ploughing, usually called the winter furrow, promotes the rotting of stubble and weeds; and if not accomplished towards the end of harvest, must be given in the winter months, or as early in the spring as possible. In giving this first ploughing, the old ridges should be gathered up, if practicable, as in that state they are kept dry during the winter months; but it is not uncommon to split them out or divide them, especially if the land had been previously highly gathered, so that each original ridge of land is divided into two half ridges. Sometimes, when the land is easily laid dry, the furrows of the old ridges are made the crowns of the new ones, or the land is ploughed in the way technically called *crown-and-furrow*. In other instances, two ridges are ploughed together, by what is called *casting*, which has been already described. After the field is ploughed, all the inter-furrows, and those of the headlands, are carefully opened up by the plough, and are afterwards gone over effectually by a laborer with a spade, to remove all obstructions, and to open up the water-furrows into the fence ditches, wherever that seems necessary, that all moisture may have a ready exit. In every place where water is expected to lodge, such as *dishes*, or hollow places in the field, cross or oblique furrows are drawn by the plough, and their intersections carefully opened into each other by the spade. Wherever it appears necessary, cross cuts are also made through the head ridges into the ditches with a spade, and every possible attention is exerted, that no water may stagnate in any part of the field.

4575. *As soon as the spring seed-time is over*, the fallow land is again ploughed end-long. If formerly split, it is now ridged up; if formerly laid up in gathered ridges, it is split or cloven down. It is then cross-ploughed; and after lying till sufficiently dry to admit the harrows, it is harrowed and rolled repeatedly, and every particle of the vivacious roots of weeds brought up to view, carefully gathered by hand into heaps, and either burnt on the field, or carted off to the compost midden. The fallow is then ridged up, which places it in a safe condition in the event of bad weather, and exposes a new surface to the harrows and roller; after which the weeds are again gathered by hand, but a previous harrowing is necessary. It is afterwards ploughed, harrowed, rolled, and gathered as often as may be necessary to reduce it into fine tilth and completely to eradicate all root-weeds. Between these successive operations, repeated crops of seedling weeds are brought into vegetation and destroyed. The larvæ likewise of various insects, together with an infinite variety of the seeds of weeds, are exposed to be devoured by birds, which are then the farmer's best friends, though often proscribed as his bitterest enemies.

4576. *The use of the harrow and roller in the fallow process*, has been condemned by some writers on husbandry, who allege, that frequent ploughing is all that is necessary to destroy root-weeds, by the baking or drying of the clods in the sun and wind; but experience has ascertained, that frequently turning over the ground, though absolutely necessary while the fallow process is going on, can never eradicate couch-grass or other root-weeds. In all clay soils, the ground turns up in lumps or clods, which the severest drought will not penetrate so sufficiently as to kill the included roots. When the land is again ploughed, these lumps are turned over and no more, and the action of the

plough serves in no degree to reduce them, or at least very imperceptibly. It may be added that these lumps likewise inclose innumerable seeds of weeds, which cannot vegetate unless brought under the influence of the sun and air near the surface. The diligent use, therefore, of the harrow and roller, followed by careful hand-picking, is indispensably necessary to the perfection of the fallow process. (*General Report of Scotland*, vol. iv. p. 419.)

4577. *When effectually reduced to fine till, and thoroughly cleaned from roots and weeds, the fallow is ploughed end-long into gathered ridges or lands, usually fifteen or eighteen feet broad; which are set out in the manner already described, in treating of the striking of furrows or *seirings*. If the seed is to be drilled, the lands or ridges are made of such widths as may suit the construction of the particular drill-machine that is to be employed. After the land has been once gathered by a deep furrow, proportioned to the depth of the cultivated soil, the manure is laid on, and evenly spread over the surface, whether muck, lime, marl, or compost. A second gathering is now given by the plough; and this being generally the furrow upon which the seed is sown, great care is used to plough as equal as possible. After the seed is sown and the land thoroughly harrowed, all the inter-furrows, furrows of the headlands, and oblique or *gaw* furrows, are carefully opened up by the plough, and cleared out by the spade, as already mentioned, respecting the first or winter ploughing.*

4578. *The expense of fallowing must appear, from what has been said, to be very considerable, when land has been allowed to become stocked with weeds; but if it be kept under regular management, corn alternating with drilled pulse or green crops, the subsequent returns of fallow will not require nearly so much labor. In common cases, from four to six ploughings are generally given, with harrowing and rolling between, as may be found necessary; and, as we have already noticed, the cultivator may be employed to diminish this heavy expense. But it must be considered, that upon the manner in which the fallow operations are conducted, depend not only the ensuing wheat crop, but in a great measure all the crops of the rotation. (Supp. to Encyc. Brit. art. Agr. 128.)*

SECT. III. Of the general Management of Manures.

4579. *The manures of animal, vegetable, or mineral origin have been already described, and their operation explained (2161.) But a very few of these substances can be obtained by farmers in general; whose standard resources are farm-yard dung and lime, and composts of these with earth. It is on the management of these that we propose to deliver the practice of the best British farmers.*

SUBSECT. 1. On the Management of Farm-yard Dung.

4580. *The basis of farm-yard dung is straw, to which is added in its progress through the farm-yard the excrementitious substances of live stock. From every ton of dry straw, about three tons of farm-yard dung may be obtained, if the after-management be properly conducted; and, as the weight of straw per acre runs from one ton to one and a half, about four tons of dung, on an average of the different crops, may be produced from the straw of every acre under corn. (Husbandry of Scotland, vol. ii.) Hence (it may be noticed) the great importance of cutting corn as low as possible; a few inches at the root of the stalk weighing more than double the same length at the ear.*

4581. *The conversion of straw into farm-yard dung in the farmery, is thus effected: The straw is served out to cattle and horses in the houses and fold-yards, either as provender or litter, and commonly for both purposes; turnips in winter, and green clover in summer are given to the stock both in the houses and yards; on this food the animals pass a great deal of urine, and afford the means of converting the straw into a richer manure than if it were eaten alone. All the dung from the houses, as they are cleaned out, is regularly spread over the yards, in which young cattle are left loose where litter is usually allowed in great abundance; or over the dunghill itself, if there be one at hand. This renders the quality of the whole mass more uniform; and the horse-dung, which is of a hot nature, promotes the decomposition of the woody fibres of the straw.*

4582. *The preparation of the contents of the farm-yard for laying on the land, is by turning it over; or, what is preferable, carting it out to a dunghill. The operation of carting out is usually performed during the frosts of winter: it is then taken to the field in which it is to be employed, and neatly built in dunghills of a square form, three or four feet high, and of such a length and breadth as circumstances may require. What is laid up in this manner early in winter, is commonly sufficiently prepared for turnips in June; but if it be not carried from the straw-yards till spring, it is necessary to turn it once or oftener, for the purpose of accelerating the decomposition of the strawey part of the mass. When dung is applied to fallows in July or August, preparatory to autumn sown wheat, a much less degree of putrefaction will suffice than for turnips: a clay soil, on which alone fallows should ever be resorted to, not requiring dung so much rotted as a finely pulverized turnip soil; and besides, as the wheat does not need all the benefit of the dung for some time, the woody fibre is gradually broken down in the course of the winter, and the nourishment of the plants continued till spring, or later, when its effects are most beneficial.*

4583. *In the application of farm-yard dung to land under tillage*, particular attention is paid to the cleanness of the soil; and to use it at the time when, from the pulverisation of the ground, it may be most intimately mixed with it. The most common time of manuring with farm-yard dung is, therefore, either towards the conclusion of the fallowing operations, or immediately before the sowing of fallow crops. If no dung can be procured but what is made from the produce of the farm, it will seldom be possible to allow more than ten or twelve tons to every acre, when the land is managed under a regular course of white and green crops; and it is thought more advantageous to repeat this dose at short intervals, than to give a larger quantity at once, and at a more distant period in proportion. (*General Report of Scotland*, vol. ii. p. 517.) Farm-yard dung, it is well known, is greatly reduced in value by being exposed to the atmosphere in small heaps, previous to being spread, and still more after being spread. Its rich juices are exhaled by the sun, or washed away by the rains, and the residuum is comparatively worthless. This is in an especial manner the case with long fresh dung, the far greater part of which consists of wet straw in an entire state. All careful farmers, accordingly, spread and cover in their dung with the plough, as soon as possible after it is brought on the land.

4584. *The use of fresh dung* is decidedly opposite to the practice of the best farmers of turnip soils; its inutility, or rather injurious effects, from its opening the soil too much, is a matter of experience with every one who cultivates drilled turnips on a large scale. As the whole farm-yard dung, on such land, is applied to the turnip crop, it must necessarily happen that it should be laid on in different stages of putrefaction; and what is made very late in spring, often after a very slight fermentation, or none at all. The experience of the effect of recent dung is accordingly very general, and the result, in almost every case, is, that the growth of the young plants is slow; that they remain long in a feeble and doubtful state; and that they seldom, in ordinary seasons, become a full crop, even though twice the quantity that is given of short muck has been allowed. On the other hand, when the manure is considerably decomposed, the effects are immediate, the plants rise vigorously, and soon put forth their rough leaf, after which, the beetle or fly does not seize on them; and in a few weeks, the leaves become so large, that the plants probably draw the greatest part of their nourishment from the atmosphere. Though it were true, therefore, that more nutritive matter were given out by a certain quantity of dung, applied in a recent state, and allowed to decompose gradually in the soil, than if applied after undergoing fermentation and putrefaction, the objection arising from the slowness of its operation, would, in many instances, be an insuperable one with farmers. But there seems reason to doubt whether fresh strawey manure would ferment much in the soil, after being spread out in so small a quantity as has been already mentioned; and also, whether, in the warm dry weather of summer, the shallow covering of earth given by the plough would not permit the gaseous matters to escape, to a much greater amount than if fermentation had been completed in a well built covered dunghill.

4585. *Another great objection to the use of fresh farm-yard dung* is, that the seeds and roots of those plants with which it commonly abounds, spring up luxuriantly on the land; and this evil nothing but a considerable degree of fermentation can obviate. The mass of materials consists of the straw of various crops, some of the grains of which, after all the care that can be taken, will adhere to the straw; of the dung of different animals voided, as is often the case with horses fed on oats, with the grain in an entire state; and of the roots, stems, and seeds of the weeds that had grown among the straw, clover, and hay, and such as had been brought to the houses and fold-yards with the turnips, and other roots given to live stock.

4586. *The degree of decomposition to which farm-yard dung should arrive*, before it can be deemed a profitable manure, must depend on the texture of the soil, the nature of the plants, and the time of its application. In general, clayey soils, as more tenacious of moisture, and more benefited by being rendered incohesive and porous, may receive manure less decomposed than well pulverised turnip soils require. Some plants, too, seem to thrive better with fresh dung than others, potatoes in particular; but all the small-seeded plants, such as turnips, clover, carrots, &c. which are extremely tender in the early stage of their growth, require to be pushed forward into luxuriant vegetation with the least possible delay, by means of short dung.

4587. *The season when manure is applied*, is also a material circumstance. In spring and summer, whether it be used for corn or green crops, the object is to produce an immediate effect, and it should therefore be more completely decomposed than may be necessary, when it is laid on in autumn for a crop whose condition will be almost stationary for many months. (*Sup. Ency. Brit. art. Agr.*)

SUBJECT. 2. *Of Lime and its Management as a Manure.*

4588. *Lime is by far the most important of the fossil manures*; and indeed it may be asserted that no soil will ever be fit for much, that does not contain a proportion of this earth, either naturally or by artificial application. Next to farm-yard dung, lime is in most general use as a manure, though it is one of a quite different character; and when judiciously applied and the land laid to pasture, or cultivated for white and green crops alternately, with an adequate allowance of putrescent manure, its effects are much more lasting, and, in many instances, still more beneficial than those of farm-yard dung. Fossil manures, Sir H. Davy observes, must produce their effect, either by becoming a constituent part of the plant, or by acting upon its more essential food, so as to render it more fitted for the purposes of vegetable life. It is, perhaps, in the former of these ways, that wheat and some other plants are brought to perfection after lime has been applied, upon land that would not bring them to maturity by the most liberal use of dung alone. This being an established fact may be considered one of the greatest importance to all cultivators.

4589. *With regard to the quantity of lime that ought to be applied to different soils*, it is much to be regretted that Sir Humphrey Davy has not thought proper to enter fully into the subject. Clays, it is well known, require a larger quantity than sands or dry loams. It has been applied, accordingly, in almost every quantity from 100 to 500 bushels or upwards, per acre. About 160 bushels are generally considered a full dressing for lighter soils, and 80 or 100 bushels more for heavy cohesive soils.

4590. *In the application of lime to arable land*, there are some general rules commonly attended to by diligent farmers, which we shall give nearly in the words of a recent publication.

1. As the effects of lime greatly depend on its intimate admixture with the surface soil, it is essential to have it in a powdery state at the time it is applied.

2. Lime having a tendency to sink in the soil, it should be ploughed in with a shallow furrow.

3. Lime may either be applied to grass land, or to land in preparation for green crops or summer fallow, with almost equal advantage; but, in general, the latter mode of application is to be preferred.

4. Lime ought not to be applied a second time to moorish soils, unless mixed up as a compost, after which the land should be immediately laid down to grass.

5. Upon fresh land, the effect of lime is much superior to that of dung. The ground, likewise, more especially where it is of a strong nature, is more easily wrought; in some instances, it is said, the saving of labor would be sufficient to induce a farmer to lime his land, were no greater benefit derived from the application than the opportunity thereby gained of working it in a more perfect manner. (*General Report of Scotland*, vol. ii. p. 536.)

4591. *In liming for improving hilly land, with a view to pasture*, a much smaller quantity has been found to produce permanent and highly beneficial effects, when kept as much as possible near the surface, by being merely harrowed in with the seeds, after a fallow or green crop, instead of being buried by the plough. As this is a matter of much importance to farmers of such land, especially when lime must be brought from a great distance, as was the case in the instance to which we are about to allude, the successful practice of one of the most eminent farmers in Britain cannot be too generally known. A few years after 1754, says Dawson, "having a considerable extent of outfield land in fallow, which I wished to lime previous to its being laid down to pasture, and finding that I could not obtain a sufficient quantity of lime for the whole in proper time, I was induced, from observing the effects of fine loam upon the surface of similar soil, even when covered with bent, to try a small quantity of lime on the surface of this fallow, instead of a larger quantity ploughed down in the usual manner. Accordingly in the autumn, about twenty acres of it were well harrowed, and then about fifty-six Winchester bushels only of unslacked lime were, after being slacked, carefully spread upon each English acre, and immediately well harrowed in. As many pieces of the lime, which had not been fully slacked at first, were gradually reduced to powder by the dews and moisture of the earth, to mix these with the soil, the land was again well harrowed in three or four days thereafter. This land was sown in the spring with oats, with white and red clover and rye-grass seeds, and well harrowed, without being ploughed again. The crop of oats was good; the plants of grass sufficiently numerous and healthy; and they formed a very fine pasture, which continued good until ploughed some years after for corn. About twelve years afterwards, I took a lease of the hilly farm of Grubbet; many parts of which, though of an earthy mould tolerably deep, were too steep and elevated to be kept in tillage. As these lands had been much exhausted by cropping, and were full of couch-grass, to destroy that and procure a cover of fine grass, I fallowed them, and laid on the same quantity of lime per acre, then harrowed, and sowed oats and grass seeds in the spring exactly as in the last mentioned experiment. The oats were a full crop, and the plants of grass abundant. Several of these fields have been now above thirty years in pasture, and are still producing white clover, and other fine grasses; no bent or fog has yet appeared upon them. It deserves particular notice, that more than treble the quantity of lime was laid upon fields adjoining, of a similar soil, but which being

fitter for occasional tillage, upon them the lime was ploughed in. These fields were also sown with oats and grass-seeds. The latter thrive well and gave a fine pasture the first year; but afterwards the bent spread so fast, that, in three years, there was more of it than of the finer grasses."

4592. *The conclusions which Dawson draws from his extensive practice in the use of lime and dung, deserve the attention of all cultivators of similar land.*

1. That animal dung dropped upon coarse, benty pastures, produces little or no improvement upon them; and that, even when sheep or cattle are confined to a small space, as in the case of folding, their dung ceases to produce any beneficial effect, after a few years, whether the land is continued in pasture, or brought under the plough.

2. That even when land of this description is well fallowed and dunged, but not limed, though the dung augments the produce of the subsequent crop of grain, and of grass also for two or three years, that thereafter its effects are no longer discernible either upon the one or the other.

3. That when this land is limed, if the lime is kept upon the surface of the soil, or well mixed with it, and then laid down to pasture, the finer grasses continue in possession of the soil, even in elevated and exposed situations, for a great many years, to the exclusion of bent and moss. In the case of Grubbet hills, it was observed, that more than thirty years have now elapsed. Besides this, the dung of the animals pastured upon such land adds every year to the luxuriance, and improves the quality of the pasture; and augments the productive powers of the soil when afterwards ploughed for grain; thus producing, upon a benty outfield soil, effects similar to what are experienced when rich infield lands have been long in pasture, and which are thereby more and more enriched.

4. That when a large quantity of lime is laid on such land, and ploughed down deep, the same effects will not be produced, whether in respect to the permanent fineness of the pasture, its gradual amelioration by the dung of the animals pastured on it, or its fertility when afterwards in tillage. On the contrary, unless the surface is fully mixed with lime, the coarse grasses will in a few years regain possession of the soil, and the dung thereafter deposited by cattle will not enrich the land for subsequent tillage.

Lastly. It also appears from what has been stated, that the four shift husbandry is only proper for very rich land, or in situations where there is a full command of dung. That by far the greatest part of the land of this country requires to be continued in grass two, three, four, or more years, according to its natural poverty; that the objection made to this, viz. that the coarse grasses in a few years usurp possession of the soil, must be owing to the surface soil not being sufficiently mixed with lime, the lime having been covered too deep by the plough. (*Farmer's Magazine*, vol. xiii. p. 69.)

Sect. IV. *Of Composts of Earth, Lime, and Dung.*

4593. *Mixing farm-yard dung, in a state of fermentation, with earth*, in which there is much inert vegetable matter; as the banks of old ditches, or what is collected from the sides of lanes, &c., will bring this inert, dead matter, consisting of the roots of decayed grasses and other plants, into a state of putridity and solubility, and prepare it for nourishing the crops or plants it may be applied to, in the very manner it acts on peat. Dung, however, mixed with earth, taken from rich arable fields which have been long cultivated and manured, can have no effect as manure to other land that the same earth and dung would not produce applied separately; because there is generally no inert matter in this description of earth to be rendered soluble.

4594. *Mixing dung, earth, and quick-lime together*, can never be advisable; because quick-lime will render some of the most valuable parts of the dung insoluble. (See 2223.) It will depend on the nature of soil or earth, whether even quick-lime only should be mixed with it to form compost. If there be much inert vegetable matter in the earth, the quick-lime will prepare it for becoming food for the plants it may be applied to; but if rich earth be taken from arable fields, the bottoms of dung-pits, or, in fact, if any soil full of soluble matter be used, the quick-lime will decompose parts of this soluble matter, combine with other parts, and render the whole mass less nourishing as manure to plants or crops, than before the quick-lime was applied to it. Making composts, then, of rich soil of this description, with dung or lime, mixed or separate, is evidently, to say no more of it, a waste of time and labor. The mixtures of earths of this description with dung produces no alteration in the component parts of the earth, where there is no inert vegetable substances to be acted on; and the mixture of earth full of soluble matter with dung and quick-lime, in a mass together, has the worst effects, the quick-lime decomposing and uniting with the soluble matter of the earth, as well as that of the dung; thus rendering both, in every case, less efficient as manures, than if applied separately from the quick-lime, and even the quick-lime itself inferior as manure for certain soils, than if it had never been mixed with the dung and earth at all. (*Farmer's Magazine*, vol. xv. p. 351.)

4595. *Mixing dung in a state of fermentation with peat*, or forming what in Scotland are called meadow-bank middens (2177.) is a successful mode of increasing the quantity of putrescent manure. The peat being dug and partially dried may either be carted into the farm-yard and spread over the cattle court, there to remain till the whole is carted out and laid upon a dunghill to ferment; or it may be mixed up with the farm-yard dung as carted out. If care be taken to watch the fermenting process, as the fire of a clay kiln is watched, a few loads of dung may be made to rot many loads of peat. Adding lime to such composts does not in the least promote fermentation, while it renders the most valuable parts of the mass insoluble. Adding sand, ashes, or earth, by tending to consolidate the mass, will considerably impede the progress of fermentation.

CHAP. II.

Of the Culture of the Cereal Grasses.

4596. *The corn crops cultivated in Britain are, wheat, rye, barley, and oats. Other culmiferous plants, as the maize, millet, and rice, have been tried with partial success in warm districts, but they have no chance whatever of ever becoming general in our climate.*

4597. *On the culture of culmiferous plants, a few general remarks may be of use to the young farmer. Culmiferous plants, like most others, have two sets of roots. The first originate with the germination of the grain, and are always under the soil, and are called the seminal roots; the second spring from the first joint which is formed above the surface of the soil, and from that joint strike down into the soil; these are called the coronal roots. The coronal roots appear chiefly intended for drawing nourishment from the soil; and, as Professor Martyn has observed, are judiciously placed for this purpose, the richest part of all soils being on or near the surface. These fibres are of larger diameter, more succulent, and never so long as the seminal or tap-root. From these facts as to the roots of culmiferous plants, some important hints may be derived as to their culture. The use of stirring the surface in spring to facilitate the entrance of the coronal roots, is obvious; the immediate effect of a top-dressing is also apparent, and also that manures may be ploughed in too deep to give the full amount of their beneficial effects to corn crops or grasses. Sagret, a scientific French agriculturist, proved experimentally, that where any of the grains or grasses are etiolated immediately after germination, by growing too rapidly, or being sown too thick, or in too warm a season, the first joint from which the coronal or nourishing roots spring, is raised above the ground, and in consequence either throws out no roots at all, or so few, as to nourish it imperfectly, in which case it either dies before it comes into flower, or before the seed is matured. (Mem. de la Soc. Ag. de Seine, tom. ii.)*

4598. *The nutritive products of the plants to be treated of in this section, are thus given by Sir H. Davy.*

Systematic Names.	English Names.	Whole quantity of soluble or nutritive matter.	Mucilage or starch.	Saccharine matter or sugar.	Gluten or albumen.	Extract, or matter rendered insoluble during the operation.
The quantity analysed, of each sort 1000 parts.						
<i>Triticum hybernum aestivum</i>	Middlesex wheat, average crop	955	765	—	190	
	Spring wheat	940	700	—	940	
	Mildewed wheat of 1806	910	178	—	32	
	Blighted wheat of 1804	650	520	—	130	
	Thick-skinned Sicilian wheat of 1810	955	725	—	530	
	Thin-skinned Sicilian wheat of 1810	961	728	—	239	
	Wheat from Poland	950	750	—	200	
	North American wheat	955	730	—	225	
<i>Hordeum vulgare</i>	Norfolk barley	920	790	70	60	
<i>Avena sativa</i>	Oats from Scotland	743	641	15	87	
<i>Secale cereale</i>	Rye from Yorkshire	792	645	38	109	

SECT. I. *Wheat.*—*Triticum*, L. *Triandria digynia*, L. and *Gramineæ*, J. *Froment*, Fr.; *Weizen*, Ger.; and *Grano*, Ital.

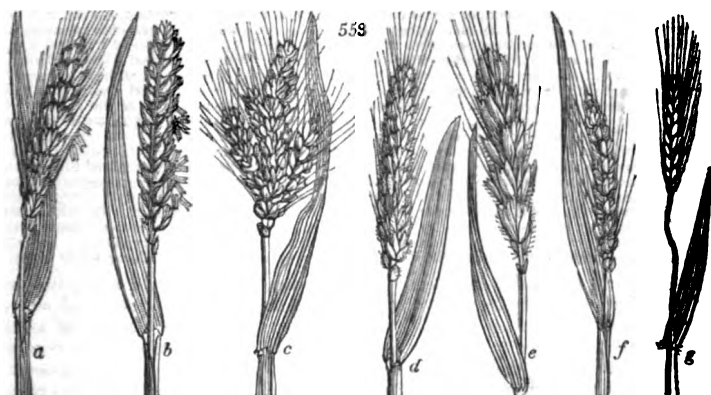
4599. *Wheat is by far the most important of the cereal grasses, the flour made from its grains or seeds, from the quantity of gluten it contains, making the best bread in the world. A greater proportion of mankind are nourished by rice than by wheat, but there is no grain which comes near this species in its qualities for bread-making. Rice and maize are comparatively unfit for it, and oats, barley, and rye but imperfectly so. Rye, however, comes nearer to wheat in its bread-making qualities, than any other grain.*

4600. *Of what country wheat is a native, is totally unknown; it has been supposed of Asia and Africa, and unquestionably it is more likely to belong to these parts of the world than any other; but all that can be advanced on this subject is conjecture. Wheat, with the exception as it is said of some parts of the southern coast of Africa, is cultivated in every part of the temperate and torrid zones, and in some places as high as 2000 feet above the level of the sea. It has been cultivated from time immemorial in Britain, but in few places at a greater elevation than 600 feet. Of course the elevation to which any plant can be cultivated, always depends on the latitude of the situation.*

4601. *Species and varieties. (fig. 553.) Botanists reckon seven species of triticum, which are or may be cultivated for their grains, besides many varieties and subvarieties of those in common culture. The species or subspecies are,*

1. *Triticum aestivum*, Summer wheat or spring wheat (c).
2. *hybernum*, Lammas wheat (b).
3. *compactum*, Egyptian wheat (c).
4. *surgidum*, Turgid wheat (d).

5. *Triticum polonicum*, Polish wheat (e).
6. *spelta*, Spelt wheat (f).
7. *monococcum*, One-grained wheat (g).



The first, second, fourth, and fifth sorts, are by many botanists considered as only varieties, and it is doubtful whether the third and sixth may not be the same; the seventh has all the marks of a distinct species, but it is very questionable whether, if much cultivated, it would always continue to produce one row of grains.

4602. *The spring or summer wheat (a)* is distinguished from that generally sown, by its narrower ears, longer beards, smaller grains, and shorter and more slender straw, and also, that it will not endure our winters. It is commonly sown in April, or even so late as May. It was known to Parkinson in 1666, but has never been much cultivated, excepting in Lincolnshire. It was tried and given up in Northumberland and Mid Lothian, and also in some counties near London. Many varieties of summer wheat were transmitted a few years ago to the president of the Board of Agriculture from the Agricultural Society of Paris, for the purpose of experiment, and were divided among several distinguished agriculturists, (*Communications to the Board of Agriculture*, vol. vii. p. 11.); but there has not yet been time for establishing their comparative merits, or their adaptation to the climate of Britain. Summer, or as it is often called, spring wheat, has however been long and extensively cultivated in some parts of England, particularly in Lincolnshire; and it is probable may be found a valuable crop in the southern counties; but the trials that have been made in the north, do not seem to entitle it to a preference over winter wheat sown in spring, or even oats or barley, in that climate.

4603. *Of the winter or common wheat (b)*, there are a great number of varieties. Professor Martyn, in *Müller's Dictionary*, has described forty-nine sorts, and Professor Thaer speaks of a hundred, but affirms that those who describe them know nothing about them, and in all probability include one sort under different names. All the varieties may be reduced to two, the white, and the brown or red grained. As subvarieties, there are the bearded and beardless, the woolly-chaffed, and thin or hairy chaffed, both of the reds and whites. To these some add another variety, which is the spring-sowing common wheat. It is stated by those who maintain that this variety exists, that through long sowing, the progeny, after a number of generations, acquires a habit of coming earlier into blossom than seed from winter-sown grain. This we think very likely, but are not aware that the variety is distinctly known by any recognizable marks in the plants. The red or brown wheats are universally considered as more hardy than the white, but as yielding an inferior flour: the woolly-white is supposed to yield the best flour; but woolly-chaffed wheats are considered as more liable to the mildew than any other.

4604. *The Egyptian, or many-spiked wheat (c)*, the turgid grey pollard or duck-bill wheat (d), and the Polish wheat (e), may, for all agricultural purposes, be considered as only varieties of the common winter wheat. They are cultivated in a few places in England, and seeds of them may be procured from the public botanic gardens; but they are in little estimation.

4605. *Speltz wheat (d)*, the *epautre* of the French, is known by its stout straw, which is almost solid, and by its strong spikes, with chaff partially awned, the awns long and stiff. The chaff adheres so close to the grain as not to be separated without great difficulty. This grain, as we have seen, is a good deal sown in the south of Europe. In France it is sown in spring, on land too coarse for common wheat, and it ripens in July and August. It is the principal wheat sown in Suabia and the north of Switzerland; and is a good deal sown in Spain. The grain is light, and yields but little flour; but it is said to contain a larger portion of gluten than common wheat, and for that reason is recommended as superior to any other in pastry and confectionary. It is not cultivated in Britain.

4606. *The one-grained wheat (g)* is known by its small thin spike, and single row of grains; the leaves and straw are remarkably small, but very hard; and the plants tiller remarkably. It is chiefly cultivated in the mountainous parts of Switzerland, where its straw, like that of the former species, is much used for thatching. The grain makes a brown light bread; but its great excellence, according to Villars, is for groat.

4607. *To procure new varieties of wheats*, the ordinary mode is to select from a field a spike or spikes from the same stalk, which has the qualities sought for; such as larger grains, thinner chaff, stiffer straw, a tendency to earliness or lateness, &c.; and picking out the best grains from this ear or ears, to sow them in suitable soil in an open airy part of a garden. When the produce is ripe, select the best ears, and from these the best grains, and sow these, and so on till a bushel or more is obtained, which may then be sown in a field apart from any other wheat. In this way, many of the varieties of our common winter wheat have been obtained; as the hedge-wheat which was reared from the produce of a stalk found growing in a hedge in Sussex, by one Wood, about 1790. Other varieties have assumed their distinctive marks from having been long cultivated on the same soil and climate, and take local names, as the Hertfordshire red, Essex white, &c.

4608. *Marshall* (Yorkshire) mentions a case in which a man of accurate observation, having, in a piece of wheat perceived a plant of uncommon strength and luxuriance, diffusing its branches on every side, and setting its closely-surrounding neighbors at defiance, marked it; and at harvest removed it separately. The produce was 15 ears, yielding 604 grains of a strong-bodied liver-colored wheat, differing, in general appearance, from every other variety he had seen. The chaff was smooth, without awns, and of the color of the grain; the straws stout and reedy. These 604 grains were planted singly, nine inches asunder, filling about 40 square yards of ground, on a clover stubble, the remainder of the ground being sown with wheat in the ordinary way; by which means extraordinary trouble and destruction by birds were avoided. The produce was two gallons and a half weighing 20½ lbs. of prime grain for seed, besides some pounds for seconds. One grain produced 35 ears, yielding 1236 grains; so that the second year's produce was sufficient to plant an acre of ground. What deters farmers from improvements of this nature is probably the mischievousness of birds; from which at harvest it is scarcely possible to preserve a small patch of corn especially in a garden or other ground situated near a habitation; but by carrying on the improvement in a field of corn of the same nature, that inconvenience is got rid of. In this situation, however, the botanist will be apprehensive of danger from the floral farina of the surrounding crop. But from what observations Marshall has made he is of opinion his fears will be groundless. No evil of this kind occurred, though the cultivation of the above variety was carried on among *white* wheat.

4609. *But the most systematic mode of procuring new varieties*, is by crossing two sorts, as in breeding: that is, by impregnating the female organs of the blossoms of one ear with the fecundating matter or pollen of the male organs of the blossom of another variety of a different quality. Thus, supposing a farmer wished to render a very good variety which he was in the habit of cultivating somewhat earlier. Let him procure in the blossoming season, from a very early soil, some spikes of an early sort just coming into blossom, and let him put the ends of these in water and set them in the shade so as to retard their fully blossoming till the plants he has destined to become the females come into flower. Then let him cut out all the male organs of the latter before they have advanced so far as to impregnate the stigma; and having done this, let him dust the stigma with the blossoming ears of the early or male parent. The impregnated stalks must then be kept apart from other wheats so as the progeny may be true. When the grains ripen, sow the best, and from the produce when ripe, select the earliest and finest spikes for seed. Sow them and repeat the choice till a bushel or two of seed is procured. This operation has been successfully performed by T. A. Knight (1600.), and though it may be reckoned too delicate for farmers in general, it will be looked on by the philosophical agriculturist as not improbably leading to as important results as has attended the practice in the case of garden fruits and flowers.

4610. *The propagation of wheat by transplanting* may be employed to expedite the progress of cultivating a new variety of ascertained excellence. To shew what may be gained in time by this mode, we shall quote from *The Philosophical Transactions* an account of an experiment made by C. Miller, son of the celebrated gardener of that name, in 1766. On the 2nd of June, Miller sowed some grains of the common red wheat; and on the 8th of August, a single plant was taken up and separated into 18 parts, and each part planted separately. These plants having pushed out several side shoots, by about the middle of September, some of them were then taken up and divided, and the rest of them between that time and the middle of October. This second division produced 67 plants. These plants remained through the winter, and another division of them, made about the middle of March and the 12th of April, produced 500 plants. They were then divided no further, but permitted to remain. The plants were, in general, stronger than any of the wheat in the fields. Some of them produced upwards of 100 ears from a single root. Many of the ears measured seven inches in length and contained between 60 and 70 grains. The whole number of ears which, by the process above-mentioned, were produced from one grain of wheat, was 21,108, which yielded three pecks and three quarters of clean corn, the weight of which was 47 lbs. 7 ounces; and from a calculation made by counting the number of grains in an ounce, the whole number of grains was about 386,840. By this account we find, that there was only one general division of the plants made in the spring. Had a second been made, Miller thinks the number of plants would have amounted to 5000 instead of 500, and the produce thereby been much enlarged.

4611. *In making a choice from all the species and varieties* which we have named, the thin-skinned white wheats are preferred by all the best British farmers whose soil and climate are suitable for this grain, and for sowing in autumn. In late situations, and less favorable soils and climates, the red varieties are generally made choice of; and these are also generally preferred for sowing in spring. Red wheats, however, are considered as at least fifteen per cent. less valuable than the white varieties. No sub-variety ever continues very long in vogue; nor is it fitting that it should, as degeneracy soon takes place, and another and better is sought for as a successor. Hence the only recommendation we can give as to the choice of subvarieties, is to select the best from among those in use by the best farmers in the given situation, or nearest well-cultivated district.

4612. *The soils best adapted for the culture of wheat*, are rich clays and heavy loams; but these are not by any means the only description of soils on which it is cultivated. Before the introduction of turnips and clover, all soils but little cohesive were thought quite unfit for wheat; but even on sandy soils, it is now grown extensively; and with much advantage after either of these crops. The greater part of the wheat crop throughout Britain, however, is probably still sown upon fallowed land. When it succeeds turnips consumed on the ground, or clover cut for hay or soiling, it is commonly sown after one ploughing; but upon heavier soils, or after grass of two or more years, the land is ploughed twice or three times, or receives what is called a rag fallow. (*Supp. Encyc. Brit. art. Agr.*)

4613. *On rich clays*, wheat may be cultivated almost every second year, provided due care

is taken to keep the land clean, and in good condition. A summer fallow once in four, six, or eight years, according to seasons and circumstances, is, however, necessary; and manure should either be applied on that fallow for the first crop of wheat, or, what some people think preferable, should be laid on the wheat-stubble for a crop of drilled beans, which ensures the succeeding crop of wheat. If the first crop of beans has been completely cleaned, there is no difficulty of repeating, and even of extending the course; and the crops will be little inferior to those gained at the beginning of the rotation, provided manure has been bestowed to each crop of beans. In this way, when the ground is fallowed every fourth year, two crops of wheat and one of beans are gained from manuring once; when fallowed every sixth year, three crops of wheat and two of beans are gained from manuring twice; and, when fallowed every eighth year, four crops of wheat and three of beans from manuring thrice. In the first-mentioned shift, less manure is bestowed than in any of the other two; and if the soil is of good quality, it will support itself; whereas, in the shifts of six and eight, unless foreign manure is procured, it rarely happens that they can go on successfully for any length of time, without abstracting dung from other parts of the farm on which they are practised. (*Brown's Tr. on Rural Affairs.*)

4614. *In cultivating wheat on thin clays*, the rotations just mentioned are inapplicable. A six-course shift of a different kind has, however, been successfully followed by many people; but it requires every branch of the work to be well executed. 1st, a summer fallow, dunged at the rate of twelve or fourteen double loads per acre; 2d, wheat; 3d, grass; 4th, oats; 5th, pease and beans drilled; 6th, wheat. If manure can be given in the middle of the shift, every one of the crops may be expected good; but if that is withheld, there will necessarily be a proportionable falling off in the two last crops. Husbandmen must, however, regulate their practice according to their means; though it deserves to be remarked, that, if greater attention were paid to the collecting of materials which ultimately are converted into manure, many deficiencies in the article would be fully supplied. (*Brown.*)

4615. *Excellent wheat may be grown on light soils*, with the exception of soft sands. Such soils, however, are not constitutionally disposed to the growth of that grain; nor will they, under any management, bear such a frequent repetition of it as those already mentioned. Summer fallow on them may safely be dispensed with; because a crop of turnips, which admits every branch of the cleaning process to be more perfectly executed than even a naked or bare fallow does, may be profitably substituted. Wheat here comes in with propriety after turnips, though, in general cases, it must be sown in the spring months, unless the turnips are stored; in which case, it may be sown in November, or it may be sown after clover, for the fourth crop after the rotation; or in the sixth year, as a way-going crop, after drilled pease and beans, if the rotation is extended to that length. But, take it any way, it is scarcely possible to raise wheat so extensively upon light soils, even where they are of the richest quality, as is practicable upon clays; nor will a crop of equal bulk upon the one, return so much produce in grain as may be got from the other. To enlarge upon this point would only serve to prove what few husbandmen will dispute, though, it may be added, that, on thin sands, wheat ought not to be ventured, unless they are either completely clayed or marled, as it is only with the help of these auxiliaries that such a soil can gain stamina capable of producing wheat with any degree of success. (*Brown.*)

4616. *The culture of the soil intended for wheat* varies according to its nature, and the preceding and following crops. "On soils really calculated for wheat, though in different degrees, summer fallow is the first and leading step to gain a good crop or crops of that grain. The first furrow should be given before winter, or so early as other operations upon the farm will admit; and every attention should be used to go as deep as possible; for it rarely happens that any of the succeeding furrows exceed the first one in that respect. The number of after-ploughings must be regulated by the condition of the ground and the state of the weather; but, in general, it may be observed, that ploughing in length and across, alternately, is the way by which the ground will be most completely cut, and the intention of fallowing accomplished. It has been argued, that harrowing clay soils, when summer fallowed, is prejudicial to the wheat crop; but, without discussing this point (such a discussion being unnecessary), it may merely be stated, that, in a dry season, it is almost impracticable to reduce real clays, or to work them too small; and that, even in a wet one, supposing they are made surface-smooth, they will, when ploughed up again, consolidate into clods or big lumps after forty-eight hours' drought, and become nearly as obdurate as ever. It is only on thin soils, which have a mixture of peat earth, and are incumbent on a bottom impervious to water, that damage is at any time sustained by over harrowing. Such are generally of a weak texture, and may be broken down with facility by the roller and harrow. If caught by much rain before the pores are in some measure closed, the moisture is greedily absorbed; and being prevented from going downwards by the hardness of the subsoil, the

whole surface becomes a kind of mortar or paste, unless previously well ridged up; which, to a certain extent, prevents the consequences from being dangerous. These evils, however, must be submitted to by the possessors of such soils, if they want to have them sufficiently fallowed and prepared in a proper manner; for, without reducing them, couch-grass, and especially moss, with which they are commonly stored, cannot be eradicated. If they are reduced in the early part of the season, the danger is small; but to break them down in the latter part ought always to be avoided, unless called for by imperious necessity.

4617. When *wheat is sown after beans*, it rarely happens, in this northern climate, that more than one ploughing can successfully be bestowed. Before this is given, it is advantageous to cross-harrow the land, which levels the drills, and permits the ploughing process to be executed with precision. Almost in every case, the ridges should be gathered up, so that the furrows may be well cleared out, and the plants preserved from injury during the inclement winter season. Clover land should be neatly ploughed, and well laid over, so that the roots of the grasses may be buried and destroyed; for it frequently happens, that crops of wheat after clover and rye-grass, are greatly injured by inattention to the ploughing process. In short, sowing wheat after clover may be considered as the most hazardous way in which that grain can be cultivated. (*Brown's Tr. on Rural Affairs.*)

4618. *The manures best calculated for wheat*, are allowed by all agricultural chemists to be animal matters and lime. The former has a direct influence in supplying that essential constituent to wheaten flour, gluten; and the latter azote and lime, both actually found in the straw of wheat. At all events, it is certain wheat will not thrive on any soil that does not contain lime. In this, Sir H. Davy, Chaptal, Professor Thaer, and Grisenthwaite fully agree.

4619. *A more abundant supply of manure* is generally required for wheat than for any other grain. Professor Thaer says it absorbs more nourishment from the soil than any of the corn tribe; and he calculates (hypothetically, as he allows) that for every 100 parts of nutriment in a soil sown with this grain, 40 will be carried off by the crop. (*Principes Raisonné*, tom. iv. art. *Froment.*) At the same time too large a dose of manure on land in good tilth is very apt to cause the crop to lodge; and hence some people think it improper to dung rich clays or loams when fallowed, and choose rather to reserve that restorative till the succeeding season, when they are prepared for a crop of drilled beans. Delaying the manuring process for a year is attended with many advantages; because good land, fully wrought, contains such a principle of action within itself, as often causes the first wheat crop to be lodged before it is filled; under which circumstance, the produce is diminished both in quantity and quality. This delay in manuring is, however, attended with disadvantages; because, when dung is kept back till the end of autumn or beginning of winter, to be laid on the stubbles, the weather is often so wet that it cannot be carted on without subjecting the land to injury from poaching, whilst the labor in laying it on is also increased. On thin clays, or even upon soils of the other description not in high condition, there can be no doubt but that the end of summer, and upon summer fallow, is the most proper time for manuring them, though it will be found that an improvident expenditure of dung, on such occasions, ought always to be steadily avoided. (*Brown.*)

4620. *Where manure is abundant*, wheat alternating with a green crop, or indeed, any corn crop and a green crop may be grown alternately for any length of time. (*Farm. Mag.* vol. xxiii. p. 298.)

4621. *The climate required to bring wheat to perfection* must be such as affords a dry and warm season for the blossoming of the ear, and the ripening of the grain. Wheat will endure a great deal of cold during winter, if sown in a dry or well drained soil; and if it be covered with snow. Hence it is that wheat is sown as far north as Petersburg and in Sweden. Moderately moist weather before the flowering season, and after the grain is set or formed, is favorable to wheat; but continued heavy rains after the flowering season produces the smut. The dry frosty winds of February and March, and even April in some districts, are more injurious to the wheats of Britain than any other description of weather. Hoar frosts, when the plant is in the ear, produce blights; and mildews often result from or follow sultry winds and fogs. Cold, in the blossoming and ripening season in July, even unaccompanied by wind or rain, produces an inferior grain, greatly deficient in gluten; and heat the contrary. The most valuable wheat of Europe in this respect, is that of Sicily; which Sir H. Davy found to contain much more gluten than the best wheat of Britain.

4622. *The season of sowing wheat on clays* is generally the latter end of autumn; but on early turnip soils it is sown after clover or turnips, at almost every period from the beginning of September till the middle of March; but the far greater part is sown in September and October. For summer wheat in the southern districts, May is sufficiently early, but in the north, the last fortnight of April is thought a more eligible seed-time. In the cultivation of spring-sown winter wheat, it is of importance to use the produce of

spring-sown grain as seed, as the crop of such grain ripens about a fortnight earlier than when the produce of the same wheat winter-sown is employed as spring seed. (*Encyc. Brit.* art. *Agr.*)

4623. *Seed wheat is prepared for sowing by the process called pickling.* According to Brown (*Treatise on Rural Affairs*, art. *Wheat*), this process is indispensably necessary on every soil; otherwise smut, to a greater or less extent, will, in nine cases out of ten, assuredly follow. Though almost all practical farmers are agreed as to the necessity of pickling, yet they are not so unanimous as to the *modus operandi* of the process, and the article which is best calculated to answer the intended purpose. Stale urine may be considered as the safest and sgest pickle; and where it can be obtained in a sufficient quantity, is commonly resorted to. The mode of using it does not, however, seem to be agreed upon; for, while one party contends that the grain ought to be steeped in the urine, another party considers it as sufficient to sprinkle the urine upon it. Some, again, are advocates for a pickle made of salt and water, sufficiently strong to buoy up an egg, in which the grain is to be thoroughly steeped. But whatever difference of opinion there may be as to the kind of pickle that ought to be used, and the mode of using it, all admit the utility of mixing the wetted seed with hot lime, fresh slaked; and this, in one point of view, is absolutely necessary, so that the seed may be equally distributed. It may be remarked, that experience justifies the utility of all these modes, provided they are attentively carried into execution. There is some danger from the first; for if the seed steeped in urine is not immediately sown, it will infallibly lose its vegetative power. The second, viz. sprinkling the urine on the seed seems to be the safest, if performed by an attentive hand; whilst the last may do equally well, if such a quantity of salt be incorporated with the water, as to render it of sufficient strength. It may also be remarked, that this last mode is oftener accompanied with smut, owing no doubt to a deficiency of strength in the pickle; whereas a single head with smut is rarely discovered when urine has been used.

4624. *A new mode of preparing wheat for sowing has recently been adopted in the south of Scotland and followed with great success.* It is thus described: "Take four vessels, two of them smaller than the other two, the former with wire bottoms, and of a size to contain about a bushel of wheat, the latter large enough to hold the smaller within them. Fill one of the large tubs with water, and, putting the wheat in the small one, immerse it in the water and stir and skim off the grains that float above, and renew the water as often as is necessary, till it comes off almost quite clean. Then raise the small vessel in which the wheat is contained, and repeat the process with it in the other large tub, which is to be filled with stale urine; and in the meantime wash more wheat in the water tub. When abundance of water is at hand, this operation is by no means tedious; and the wheat is much more effectually cleansed from all impurities, and freed more completely from weak and unhealthy grains and seeds of weeds, than can be done by the winnowing machine. When thoroughly washed and skimmed, let it drain a little, then empty it on a clear floor or in the cart that is to take it to the field, and sift quick-lime upon it, turning it over and mixing it with a shovel, till it be sufficiently dry for sowing." (*Sup. E. Brit.* art. *Agr.*)

4625. *The quantity of seed necessary depends both on the time of sowing and the state of the land; land sown early requiring less than the same land when sown in winter or spring; and poor land being at all times allowed more seed than the rich.* The quantity accordingly varies from two bushels or less, to three, and sometimes even to four bushels per English statute acre. Winter wheat, when sown in spring, ought always to have a liberal allowance, as the plants have not time to tiller much without unduly retarding their maturation. (*Supp.*, &c.) Upon well prepared lands, if the seed be distributed equally, it can scarcely be sown too thin; perhaps two bushels per acre are sufficient; for the heaviest crops at autumn are rarely those which shew the most vigorous appearance through the winter months. Bean stubbles require more seed than summer fallows; because the roughness of their surface prevents such an equal distribution; and clover layers ought to be still thicker sown than bean stubbles. Thin sowing in spring ought not to be practised, otherwise the crop will be late, and imperfectly ripened. (*Brown.*)

4626. *The modes of sowing wheat are either broad-cast, drilling, ribbing, or dibbling.* The first mode is by far the most general, and the seed is for the most part covered by the harrows. No more harrowing, Brown observes, should be given to fields that have been fallowed, than what is necessary to cover the seed, and level the surface sufficiently. Ground which is to lie in a broken down state through the winter, suffers severely when an excessive harrowing is given, especially if it is incumbent on a close bottom; though, as to the quantity necessary, none can give an opinion, except those who are personally present.

4627. *Ploughing in.* Many farmers allege that wheat which is harrowed in is apt to be thrown out in spring; or if not thrown out at that season, that it does not tiller well, and that the stalks are apt to dwindle away and fall down in the flowering season. It is certain that this is the case in many parts of England; and the cause assigned by the

northern farmers is the defective manner in which the land is ploughed, by which there is not sufficient covering for the seed. To guard against these evils it is a very general practice in most of the southern counties, when wheat is sown broad-cast, to plough it in with a shallow furrow. This is done even after beans and on clover leys, and is a favorite practice on very opposite soils, as in Norfolk and Middlesex.

4628. *Drilling*, however, is extensively practised in some districts, and is becoming more general on lands infested with the seeds of annual weeds, especially when sown in spring. A machine which sows at three different intervals, according to the judgment of the farmer, of twelve, ten and a half, or nine inches, is much approved of in the northern districts. It deposits six, seven, or eight rows at once, according as it is adjusted to one or other of these intervals, and the work is done with ease and accuracy when the ridges are previously laid out of such a breadth, twelve and a half feet, as to be sown by one bout; the machine going along one side of such a ridge, and returning on the other, and its direction being guided by one of its wheels, which thus always runs in the open furrow between the ridges. If the ten and a half inch interval be adopted, and it is the most common one in that country, the machine sows seven rows at once, or fourteen rows on a ridge of twelve feet and a half. But the space between the rows varies in some parts still more than this machine admits of; it ought not, however, to be so narrow as to prevent hand hoeing, even after the crop has made considerable progress in growth; and it cannot advantageously be so wide as to admit the use of any effective horse-hoe.

4629. *Ribbing* is a mode of sowing common in some places, by which a drill machine is dispensed with, though the same purpose is nearly answered. This is what is called *ribbing*, which we have already adverted to in the section on tillage. The seed is scattered with the hand in the usual broad-cast manner, but as it necessarily falls for the most part in the furrows between the ribs, the crop rises in straight parallel rows, as if it had been sown by a drill machine; after sowing the ribs are levelled by harrowing across them. This plan has nearly all the advantages of drilling in so far as regards exposure to the rays of the sun, and the circulation of air among the plants; but as some plants must always rise between the rows, it is not quite so proper when horse-hoeing is required. (*Sup. E. Brit.*)

4630. *The dibbling of wheat* is practised in some parts of Norfolk. The furrow is laid over flat, and a row of holes is made along the middle of each by a man who uses a dibber in each hand. A middling workman will make four holes in a second. One dibbler is sufficient for three droppers; whence one man and three children are called a *set*. The dibbler carries on three flags or turned furrows; going on some yards upon one of the outside furrows, and returning upon the other, after which he takes the middle one; and thus keeps his three droppers constantly employed; and at the same time is in no danger of filling up the holes with his feet. The droppers put in two or three grains of wheat into each hole; but much time and patience is necessary to teach them to perform the business properly and quickly. An expert dibbler will hole half an acre in a day; though one-third of an acre is usually reckoned a good day's work. The seed is covered by means of a bush harrow; and from one bushel to six pecks is the usual quantity for an acre. Notwithstanding the advantages of saving seed, as well as some others which are generally reckoned undeniable, it is asserted by some very judicious farmers, that dibbling of wheat on the whole is not really a profitable practice. It is particularly said to be productive of weeds unless dibbled very thick: which indeed may probably be the case as the weeds are thus allowed a greater space to vegetate in. Marshal is of opinion, that the dibbling of wheat appears to be peculiarly adapted to deep rich soils, on which three or four pecks dibbled early may spread sufficiently for a full crop; whereas light, weak, shallow soils, which have lain two or three years, and have become grassy, require an additional quantity of seed, and consequently an addition of labor, otherwise the plants are not able to reach each other, and the grasses of course find their way up between them, by which means the crop is injured and the soil rendered foul. If a single grain of good size and sound, could be dropt in each hole and no more, there might be an advantage in dibbling where it could be accomplished at a moderate rate; but where two or three grains are put in each hole, and often six or eight, the source of profit is diminished or destroyed by twofold means; first, by using too much seed; and secondly, because three or four grains springing out of one hole will not make such a strong plant or stool as one sound grain. The only way in which we can conceive dibbling likely to answer is by the use of a machine such as that invented by Plunkett (2469.), but which never came into use. To attempt dibbling either wheat or beans by hand on a large scale, we consider as quite unsuitable for the present improved state of agriculture.

4631. *The after culture of wheat*, or culture of the growing crop, depends on the manner in which it has been sown. When wheat is sown broad-cast, the subsequent culture must generally be confined to harrowing, rolling, and hand-hoeing. As grass seeds are frequently sown in spring on winter-sown wheat, the harrows and roller are employed to loosen the soil, and cover the seeds. But these operations, to a certain extent, and at the proper season, are found beneficial to the wheat crop itself, and are sometimes performed even when grass seeds are not to be sown. One or two courses of harrowing penetrate the crust which is formed on tenacious soils, and operate like hand-hoeing in raising a fresh mould to the stems of the young plants. Rolling in spring ought never to be omitted on dry porous soils, which are frequently left in so loose a state by the winter frosts, that the

roots quit the soil and perish; and if the land be rough and cloddy, the roller has a still more beneficial effect than the harrows in pulverising the inert masses, and extending the pasture of the plants. Hand-weeding, so far as to cut down thistles and other long weeds, is never neglected by careful farmers; but the previous culture ought to leave as little as possible of this work to be done when the crop is growing. (*Supp.*)

4632. *When wheat has been drilled, ribbed, or dibbled, the intervals may be hoed or stirred either by hand-hoes, common or pronged, or by horse-hoes, or drill harrows.* In general, the drill used at sowing, will by the changes it admits of in its double character of drill and horse-hoe, be the best to use for hoeing or stirring. Or if a single drill should have been used, the expanding horse-hoe, or Blakie's inverted horse-hoe, may be successfully adopted. The operation of hoeing or stirring should generally be performed in March, and need not be repeated. When grass-seeds are to be sown among the wheat, the hoeing is an excellent mode of covering them. Weeding the rows should not be neglected, nor delayed later than the beginning of June.

4633. *Where wheats rise too thin in some places, and too thick in others, whether in rows or broad-cast, the practice of transplanting from the latter to the former has been recommended.* This is said to be practised occasionally in Essex and Norfolk, and the time is the end of March. To be attended with success the soil must be in a good state, and the blanks to which the plants are to be transplanted, must be stirred up with a trowel or small two-pronged fork. Under such circumstances we have no doubt of the plan being attended with success; but we are certain that without stirring the soil, the operation will not pay for the expense. Blanks are sometimes filled up by sowing summer wheat, dibbling beans, &c. but these are obviously bad modes; a better is either to stir the soil well, and encourage the tillering of the plants, or to stir the soil and then transplant.

4634. *Top dressing wheat crops has been recommended, in cases where the land is not in a sufficient state of fertility or preparation to bring the crops to perfection.* Substances of both the solid and fluid kinds have been made use of for this purpose; the first consist chiefly of the dung of different sorts of birds after being brought into a powdery state, bone dust, soot, peat ashes, and various saline matters. The latter are principally the drainings of dunghills and other similar liquid materials. The former should be thinly sown over the crop with as much evenness as possible, as early in the spring as horses can be admitted upon the land without injury; and if it can be done when the weather is inclined to be moist, it is the better, a roller may then be passed over the crop with advantage. Where the latter substances are made use of, care should always be taken that the plants be not injured by having too large a quantity applied to them. In this practice the expense should be a primary consideration, and small trials first made where dungs have not been used. The proper season for performing the business is the beginning of February.

4635. *When wheat appears too forward and luxuriant, it is sometimes eat down in April, with sheep or even with horses, but this requires great judgment to be effected without injuring the crop.*

4636. *In harvesting wheat, the best farmers both of Britain and the continent agree, that it ought to be cut before it become dead ripe.* When the latter is the case, the loss is considerable, both in the field and stack-yard, and the grain, according to Professor Thær, produces a less white flour. In ascertaining the proper state, Brown observes, it is necessary to discriminate betwixt the ripeness of the straw, and the ripeness of the grain; for, in some seasons, the straw dries upwards; under which circumstance, a field, to the eye, may appear to be completely fit for the sickle, when, in reality, the grain is imperfectly consolidated: and perhaps not much removed from a milky state. Though it is obvious that, under such circumstances, no further benefit can be conveyed from the root, and that nourishment is withheld the moment that the roots die; yet it does not follow, that grain so circumstanced should be immediately cut: because, after that operation is performed, it is in a great measure necessarily deprived of every benefit from the sun and air, both of which have greater influence in bringing it to maturity, so long as it remains on foot, than when cut down, whether laid on the ground, or bound up in sheaves. The state of the weather at the time also deserves notice; for, in moist, or even variable weather, every kind of grain, when cut prematurely, is more exposed to damage than when completely ripened. All these things will be studied by the skilful husbandman, who will also take into consideration the dangers which may follow, were he to permit his wheat crop to remain uncut till completely ripened. The danger from wind will not be lost sight of, especially if the season of the equinox approaches; even the quantity dropped in the field, and in the stack-yard, when wheat is over ripe, is an object of consideration. Taking all these things into view, it seems prudent to have wheat cut before it is fully ripe, as less damage will be sustained from acting in this way than by avoiding a contrary practice.

4637. *The mode of reaping wheat is almost universally by the sickle.* When cut, it is usually tied up in sheaves, which it is better to make so small as to be done by bands the

length of the straw, than so thick as to require two lengths to be joined for bands. The sheaves are set up in *shocks* or *stooks*, each containing in all twelve, or if the straw be long, fourteen sheaves. In the latter case, two rows of six sheaves are made to stand in such a manner as to be in contact at the top, though in order to admit the circulation of air they are placed at some distance below : along this line, two sheaves more are placed as a covering, the corn end of both being towards the extremities of the line. In a few days of good weather the crop is ready for the barn or stack-yard. In the stack-yard it is built either in oblong or circular stacks, sometimes on frames supported with pillars to prevent the access of vermin, and to secure the bottom from dampness ; and as soon afterwards as possible the stacks are neatly thatched. When the harvest weather is so wet as to render it difficult to prevent the stacks from heating, it has been the practice to make funnels through them, a large one in a central and perpendicular direction, and small lateral ones to communicate with it. In the best cultivated counties the use of large barns for holding the crop is disapproved of, not only on account of the expense, but because corn keeps better, or is less exposed to damage of any kind in a well-built stack.

4638. *The threshing of wheat*, before machines for that purpose were introduced, was an arduous and difficult task. The expense was very considerable, whilst the severity of the labor almost exceeded the power of the strongest man, especially in unfavorable seasons, when the grain adhered pertinaciously to the ear, and could not, without difficulty, be completely loosened and removed. In such seasons, expense was the smallest consideration which influenced the husbandman ; it was the quantity of grain unavoidably lost which occupied his attention ; and, as it appeared difficult to find out a remedy, most people considered it as an evil which could scarcely be avoided. In short, the loss was great in almost every case, but greater with wheat than any other grain. Every thing of this nature, however, may be prevented, now that threshing machines are introduced, provided the feeder is careful, and proportions the quantity on the board to the strength of the impelling power. Wheat, in fact, is now the cleanest threshed grain ; because the length of the straw allows it to be properly beat out before it passes the machine, which sometimes is not the case with short oats and barley. If horses are used as the impelling power, thin feeding is necessary, otherwise the animals may be injured ; but where wind or water is employed, the business of threshing is executed speedily, completely, and economically. (*Brown.*)

4639. *In performing the operation* one man feeds the grain in the straw into the machine, and is assisted by two half-grown lads, or young women, one of whom pitches or carries the sheaves from the boy close to the threshing-stage, while the other opens the bands of every sheaf, and lays the sheaves successively on a small table close by the feeder, who spreads them evenly on the feeding stage, that they may be drawn in successively by the fluted rollers, to undergo the operation of threshing. In the opposite end of the barn or straw-house, into which the rakes or shakers deliver the clean threshed straw, one man forks up the straw from the door to the *straw-mow*, and two lads, or young women, build it and tread it down. In a threshing-machine, worked by water or wind, this is the whole expense of hand labor in the threshing part of the operation, and as a powerful machine can easily thresh from two to three hundred bushels of grain in a working day of nine hours, the expense is exceedingly small indeed. Assuming two hundred and fifty bushels as an average of the work of these people for one day, and their wages to be nine shillings, the expense does not amount to one halfpenny for each bushel of grain. Even reducing the quantity of grain threshed to one hundred and fifty bushels, the easy work of a good machine of inferior size and power, the expense does not exceed three farthings the bushel. But the whole of this must not be charged against the threshing only, the grain being half dressed at the same time, by passing through one winnowing-machine, which is always attached to a complete threshing-mill ; and where a second can be conveniently connected with it, as is commonly the case if the mill be of considerable power, the corn comes down nearly ready for market. So that the threshing, dressing, and building of the straw, with the use of a powerful water-mill, will scarcely cost more than dressing alone when the flail is employed ; after every reasonable allowance for the interest of money, and the tear and wear of the machine.

4640. *When grain is threshed with a machine worked by horses*, the expense is necessarily and considerably enhanced. One capable of effecting the larger quantity of work, already calculated on, will require eight good horses, and a man to drive them, who may perhaps require the aid of a boy. The value of the work of eight horses for a day cannot be less than forty shillings, and the wages of the driver may be called two shillings and sixpence. Hence the total expense of threshing two hundred and fifty bushels will amount to $\text{£} 2, 2s, 6d.$; or about two-pence per bushel, when the wages of the attendants are added ; still leaving a considerable difference in favor of threshing by the machine, in preference to the flail. Were it even ascertained that the expense of threshing by horses and by the flail is nearly the same, horse-mills are to be recommended on other accounts ; such as better threshing, expedition, little risk of pillering, &c.

4641. *The produce of wheat* must of course vary according to the soil, climate, culture, and kind grown. Professor Thaer says, that in general it gives double the weight of straw that it does of grain ; on elevated grounds something less ; and on low grounds something more. An acre, therefore, which produces four quarters of wheat, weighing sixty-one pounds per bushel, ought to produce about $177\frac{1}{2}$ cwt. of straw ; two loads, or $22\frac{1}{2}$ cwt., however, is only reckoned a tolerable crop in this country. The yield of grain in some seasons has been under twenty ; while in others it is upwards of thirty bushels the acre, the soil and culture being in every respect the same. The average produce of Britain has been estimated at three, three and a half, and four quarters ; and one of the largest crops ever heard of, at ten quarters, and the least at one and a half quarter. The proportion which the corn bears to the straw, in Middlesex, is eleven and a half bushels to a load of thirty-six truss of thirty-six pounds each, or eleven and a half cwt.,

no great deviation from Professor Thaer's general estimate, a bushel of wheat weighing about six or six and a half cwt.

4642. *To judge of a sample of wheat*, examine by the eye whether the grain be perfectly fed or full, plump and bright, and whether there be any adulteration proceeding from sprouted grains, smut, or the seeds of weeds; and by the smell, whether there be any improper impregnation, and whether it has been too much heated in the mow, or upon the kiln; and finally, by the feel, to decide if the grain be sufficiently dry, as when much loaded with moisture it is improper for the uses of the miller and baker. In cases where a sample handles coarse, rough, and does not slip readily in the hand, it may be concluded not to be in a condition either for grinding or laying up for keeping.

4643. *The yield of wheat in flour* is, on an average, thirteen pounds of flour to fourteen pounds of grain. In the chemical analysis of wheat, Sir Humphry Davy found that one hundred parts of good full-grained wheat, sown in autumn, yielded of starch seventy-seven, and of gluten nineteen. One hundred parts of wheat sown in spring, seventy of starch, and twenty-four of gluten. American wheats he found to contain more gluten than the British; and in general the wheat of warm climates he found abounded more in gluten, and in insoluble parts, and of greater specific gravity, harder and more difficult to grind.

4644. *The uses of wheat* in the baking, culinary, and confectionary arts are well known. It is also used for making starch, by steeping the grain and then beating it in hempen bags. The mucilage is thus mixed with the water, produces the acetous fermentation, and the weak acid thus formed renders the mucilage white. After settling, the precipitate is repeatedly washed, and then moulded into square cakes, and kiln dried. In drying the cakes separate into flakes, as in the starch of the shops. Starch is soluble in hot water, but not in cold; and hence, when ground down, it makes an excellent hair-powder. Its constituents are; carbon, 43.55; oxygen, 49.68; and hydrogen, 6.77 = 100.

4645. *The uses of wheat-straw* are various, and well known: as fodder it is, according to Professor Thaer, the most nourishing of any; and it makes the best thatch: it is generally preferred for litter, though rye and barley-straw are softer; it is used for making bee-hives, horse-collars, mattresses, huts, boxes, baskets, and all kinds of what is called Dunstable work; for the cider press, and, among other things, for burning, to procure potash form the ashes. The straw of wheat, from dry chalky lands, is manufactured into hats both for men and women. For this purpose, the middle part of the tube, above the last joint, is taken, and being cut into a length of eight or ten inches, is split in two. These splits are then plaited, by females and children, into various kinds of plait or ribbands, from half an inch to an inch broad: these, when sewed together according to fancy or fashion, form different descriptions of ladies' bonnets, and the commoner plait and coarser straw of mens' hats. The hats are whitened by being placed in the vapor of sulphur. Leghorn hats are made from the straw of a bearded variety of wheat, which some have confounded with rye. It is cultivated on the poorest sandy soils in the neighborhood of the Arno, between Leghorn and Florence, expressly for this manufacture. It is of humble growth, and not above eighteen inches high; is pulled up when green, and bleached white, by spreading and watering on the gravelly banks of the Arno. The straws are not split; but in other respects the manufacture into ribbands is the same as at Dunstable in England.

4646. *The diseases of wheat* are the rust, smut, or black mildew, the latter including what is vulgarly called blight. These have been already treated of in our view of the vegetable economy, and we shall merely offer a few practical observations on the smut and mildew. In whatever manner the smut may be transmitted from the seed pickle in the ground to the ear, it seems certain that, in general, the proximate cause of smut is the infection of the seed by the dust of the smut-ball (*Lycoperdon globosum*); and that, though the most careful washing, even with the application of caustics, may not, in every case, insure against smut; yet, if the seed be prepared in the way already mentioned, the disease will never prevail to such a degree as to effect materially the value of the crop. This is all that cultivators need to know, and all, perhaps, in the present state of science, that can be known, of the cause and prevention of smut.

4647. *Mildew* is a much more destructive distemper than smut, and, as it is probably occasioned by a peculiar state of the atmosphere during the periods of flowering and ripening, it is likely to baffle all attempts at prevention. The prevalence of heavy fogs, or mist, drizzling rains and sudden changes in the temperature, have been assigned as the causes of mildew; and as it has been found, that open airy exposures are much less affected than low sheltered lands, in years when mildew prevails most generally, the disorder may perhaps be somewhat diminished by drilling, which admits a freer circulation of air. Spring or summer wheat is less liable to mildew than the winter species, though it does not always escape. Minute parasitical fungi are commonly detected on the straw of mildewed wheat; and there cannot be the least doubt that the barberry bush and probably several other shrubs, on which these fungi abound, have a powerful influence in communicating the disease to a certain distance. (*Str Joseph Banks on Mildew, and Com. to the B. of Agr. vol. vii.*)

4648. *The culture of summer wheat* differs from that of winter or spring-sown winter wheat, in its requiring a more minutely pulverised and rather richer soil. It need not

be sown sooner than April, and it advances so rapidly to maturity that it hardly affords time for hoeing (if sown in rows) or harrowing and rolling. When grass seeds or clover are sown on the same ground, they are sown immediately after the wheat, and harrowed in with a light harrow or rolled in. In this, and indeed, all other respects, the preparation of the soil and sowing of this grain is the same as for barley.

4649. *The produce of summer wheat*, both in grain and straw, is considerably less than that of winter wheat; the straw is only fit for litter or inferior fodder; the flour produced by the grain is rather coarser and darker than that of common wheat. Of course this sort of wheat cannot, as already observed, be recommended for general culture,

SECT. II. *Rye*. — *Secale Cereale*, L. *Trian. Dig. L. and Graminea*, J. Siegle, Fr.; *Rogon*, Ger.; and *Segale*, Ital. (fig. 554.)

4650. *Rye*, according to some, is a native of Crete; but it is very doubtful if it be found wild in any country. It has been cultivated from time immemorial, and is considered as coming nearer in its properties to wheat than any other grain. It is more common than wheat on most parts of the continent; being a more certain crop, and one which requires less culture and manure. It is the bread corn of Germany and Russia. In Britain it is now very little grown; being no longer a bread corn, and therefore of less value to the farmer than barley, oats, or pease.

4651. *The varieties of rye* are not above two, known as winter and spring rye; but there is so little difference between them, that spring rye sown along with winter rye can hardly be distinguished from it.

4652. *The soil for rye* may be inferior to that chosen for wheat: it will grow in dry sandy soils, and produce a tolerable crop, and on the whole it may be considered as preferring sands to clays. The preparation of the soil should be the same as for wheat. According to Professor Thaer, rye abstracts 30 parts in a hundred of the nutriment contained on the soil in which it is grown.

4653. *The climate for rye* may be colder than for wheat; but it is rather more injured by rains during winter; and equally injured as wheat by moist weather during the flowering season.

4654. *Rye is sown* either in autumn or spring, and either broad-cast or in drills: two bushels and a half is the usual allowance when it is sown broad-cast. As it vegetates more slowly than wheat, it should be sown when the soil is dry: a wet soil being apt to rot the grain before it has completely germinated. No pickling or other preparation is given.

4655. *The after culture, harvesting, and threshing* are the same as for wheat: and the produce in grain is, under similar circumstances, equal in bulk: but in straw it is greater in rye than in any other grain. Sir H. Davy found in 1000 parts of rye 61 parts of starch and 5 parts of gluten. Professor Thaer says, rye is the most nourishing grain next to wheat. It contains an aromatic substance, which appears to adhere more particularly to the husk; since the agreeable taste and smell peculiar to rye-bread is not found in that which is made from rye-flour that has passed through a very fine bolting-cloth; while the fragrance may be restored by a decoction of rye-bran in the warm water used to make the dough. This substance, Thaer says, seems to facilitate digestion, and has an action particularly refreshing and fortifying on the animal frame.

4656. *The use of rye* is chiefly for bread, especially for gingerbread. It is also used in the distilleries; and the straw is used for the same purposes as that of wheat, excepting that it is useless as fodder. Some prefer it for thatching and litter, and also for collar-making; it is also employed in Dunstable work. Tanners are said to use it in some districts.

4657. *Rye is sometimes sown as a green crop*, with a view of affording some keep for sheep early in the spring; and also for being ploughed in as manure; but that husbandry must be bad or unfortunate which requires recourse to either mode. In some districts it is customary to sow the head-lands of wheat-fields with rye, which is said to keep poultry from penetrating to the wheat.

4658. *Rye is subject to few diseases*, and is even sown among wheat and round wheat-fields, from an idea that it will keep off blight and mildew, as well as poultry.

SECT. III. *Barley*. — *Hordeum*, L. *Trian. Dig. L. and Graminea*, J. L'Orge, Fr.; *Gerste*, Ger.; and *Orzo*, Ital.; *Byg*, Dan. and Swed.

4659. *Barley*, though less calculated for a bread-corn than rye, may be considered as next in value to wheat in Britain. Of what country it is a native is unknown: some assign it to Tartary, others to Siberia, and even Scotland has been mentioned. It has been cultivated from the earliest antiquity, and was much in use among the Romans, both as food for soldiers and horses. In Sweden and Lapland it is more cultivated than any



other grain, on account of its requiring to be so short a period in the soil; sometimes not longer than six weeks, and not often more than seven or seven and a half. In Spain and Sicily they have two crops a year on the same soil: one is sown in autumn and ripens in May, and the other is sown in May and reaped in autumn. In Britain, barley is a tender grain, and easily hurt in any of the stages of its growth, particularly at seed time; a heavy shower of rain will then almost ruin a crop on the best prepared land; and in all the after processes, greater pains and attention are required to insure success, than in the case of other grains. The harvest process is difficult, and often attended with danger; even the threshing of it is not easily executed with machines, because the corn generally adheres to the grain, and renders separation from the straw a troublesome task.

4660. *Species and varieties.* (fig. 555.) There are six species and subspecies of this grain in cultivation besides varieties. These are:

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| 1. <i>Hordeum vulgare</i> , Spring barley (a). | 4. <i>Hordeum distichon</i> , Common or long-eared barley (c). |
| 2. <i>Hordeum jubatum</i> , Siberian barley. | 5. <i>Hordeum nudum</i> , Naked barley. |
| 3. <i>Hordeum hexastichon</i> , Winter barley (b). | 6. <i>Hordeum spretum</i> , Sprat or battledore (d). |

The second and fifth sort are allowed to be subspecies or varieties of the first and fourth, and indeed there can be little doubt that the whole do not constitute more than one species.



4661. *The spring barley or early barley* (a), is distinguished by its double row of beards or awns standing erect, and its thin husk which renders it favorable for malting. This is the sort principally cultivated in the southern and eastern districts of both England and Scotland, and of which the farmers make two sorts, viz. the common, and the rath-ripe barley: but these two sorts are in reality the same: for the rath-ripe is only an alteration of the common barley, occasioned by being long cultivated upon warm gravelly soils. The seed of this, when sown on cold, or strong land, will, the first year, ripen near a fortnight earlier than the seed taken from strong land, and therefore the farmers in the vales generally purchase their seed-barley from the warm or gravelly lands; for, when preserved in the vales two or three years, it becomes full as late in ripening as the common barley of their own product: on the other hand, the farmers on warm lands are also obliged to procure their seed-barley from the strong lands, otherwise their grain would degenerate in bulk or fulness, which, by this change, is prevented.

4662. *The Siberian barley, Orge celeste*, Fr. and *Himmels gerste*, Ger., is a variety of early barley with broader leaves and reckoned more productive than the other. It is much grown in the north of Europe, and was introduced to this country in 1768, but is believed to be now lost or merged in the parent species.

4663. *Winter barley, late barley, or square barley* (b), has the grains disposed in four or six rows, large and thick skinned. It is chiefly cultivated in the north of England and in Scotland, on account of its hardness; but from the thickness of its rind it is ill adapted for malting, and is growing out of use.

4664. *Bigg, bygg, or barley bigg*, is a variety of winter barley known by always having six rows of grains, by the grains being smaller and the rind thicker, and by its being earlier than the parent variety. Professor Martyn says, he has frequently counted forty-two grains on one ear of bigg, when common or long-eared barley had only twenty-two.

4665. *Common or long-eared barley* (c), is known by its very long spike or ear, flattened transversely, greater in breadth than thickness, with chaff ending in an awn sixteen times the length of the grain. This sort is cultivated in many parts of England and Scotland; though some object to it because the ears being long and heavy they think it apt to lodge.

4666. *Naked barley, or wheat barley*, is known by the grain separating easily from the chaff, and is by some considered as nothing else than spelt wheat, which it greatly resembles. It does not appear to be cultivated at present in any part of Britain.

4667. *Sprat, or battledore barley* (d), is known by its low stature, coarse straw, short broad ears, and long awns. The long awns and closeness of the ears protect it better from birds than most other sorts, but as the straw is scanty and of little use it is not much cultivated.

4668. Besides these sorts there are some local varieties, as Thanet barley, Putney barley, &c. which are merely names given to the varieties common in those places. The Thanet is the winter, and the Putney the sprat barley.

4669. *New varieties* may be procured by selection or crossing, as in the case of wheat. (4607.)

4670. In choosing a sort of barley for cultivation, regard must be had to the soil and climate. The hardest may be considered the winter barley, and the earliest, and perhaps the best, is the spring barley. The long-eared is also a much esteemed variety. In choosing from any particular variety, the best grain for sowing is that which is free from blackness at the tail, and is of a pale lively yellow color, intermixed with a bright whitish cast; and if the rind be a little shrivelled, it is so much the better, as it shows that it has

sweated in the mow, and is a sure indication that its coat is thin. The husk of thick rind ed barley being too stiff to shrink, will lie smooth and hollow, even when the inside flour has shrunk from it. The necessity of a change of seed from time to time, by sowing that of the growth of a different soil, as has been observed, is in no instance more evident than in the culture of this grain, which otherwise becomes coarser and coarser every year. But in this, as well as in all other grain, the utmost care should be taken that the seed be full bodied.

4671. *The best soil for barley* is a light rich loam, finely pulverised. It will neither grow well on a sandy or soft soil, nor on strong clays, such as are suitable for wheat.

4672. *The preparation of the soil* is sometimes by a naked fallow, but generally by a turnip fallow : sometimes it is taken after pease and beans, but rarely by good farmers, either after wheat or oats, unless under special circumstances. When sown after turnips, it is generally taken with one furrow, which is given as fast as the turnips are consumed, the ground thus receiving much benefit from spring frosts. But often two or more furrows are necessary for the fields last consumed ; because, when a spring drought sets in, the surface, from being poached by the removal or consumption of the crop, gets so hardened as to render a greater quantity of ploughing, harrowing, and rolling necessary, than would otherwise be called for. When sown after beans and pease, one winter and one spring ploughing are usually bestowed ; but, when after wheat or oats, three ploughings are necessary, so that the ground may be put in proper condition. These operations are very ticklish in a wet and backward season, and rarely in that case is the grower paid for the expense of his labor. Where land is in such a situation as to require three ploughings before it can be seeded with barley, it is better to summer fallow it at once, than to run the risks which seldom fail to accompany a quantity of spring labor. If the weather be dry, moisture is lost during the different processes, and an imperfect germination necessarily follows : if it be wet, the benefit of ploughing is lost, and all the evils of a wet seed-time are sustained by the future crop. (*Brown.*)

4673. *To whatever crop barley succeeds*, the harrow and roller, when the plough alone is insufficient, should be employed in reducing the soil to a considerable degree of fineness. In most cases more than one earth is given ; though, after a winter furrow, the grubber may be used in spring instead of the plough. After turnips, eaten on the ground by sheep, the land, being consolidated by their treading, sometimes receives two ploughings ; but if only one, it should be well harrowed and rolled ; and it is often finished by harrowing after the roller, especially if grass-seeds be sown, which are covered by this last harrowing. Barley is sometimes sown on the first ploughing, and covered by a second shallow ploughing. As it is found of great importance, with a view to speedy and equal vegetation, that the ground should be fresh and moist, barley is generally sown upon what is termed *hot-fur*, that is, as soon as possible after it is turned up by the plough.

4674. *Manure* can seldom be given with advantage to a crop that occupies the soil so short a period as barley, and therefore it generally is sown on land which has been enriched for a preceding crop.

4675. *The climate* in which barley delights is warm and dry. There are instances of a crop being sown and ripened without having enjoyed a single shower of rain ; but gentle showers from the time it is sown till it begins to shoot into the ear, are favorable ; while heavy rains at any period, and especially immediately after sowing, or during the blossoming, ripening, and reaping season, are highly injurious.

4676. *The best season for sowing barley* is considered to be from the beginning of April to the middle of May ; but bigg may be sown either in autumn to stand the winter, or as late as the first week of June. In England, the winter or four-rowed barley is frequently sown in autumn, and stands the most severe winters. With respect to the lateness at which bigg and summer barley may be sown, much depends on the sort of weather which occurs during the first three weeks after sowing. When barley is sown late it is sometimes steeped in common water to promote its germination ; but it is seldom pickled or otherwise prepared. The advantages of steeping are procuring an equal germination, and consequently ripening and getting the start of weeds. The following directions are given for performing the operation. First, take out about one-third of the contents of the sacks of seed barley or bear to allow for the swelling of the grain ; lay the sacks with the grain to steep in clean water ; let it be covered with it for at least twenty-four hours ; when the ground is very dry, and no likelihood of rain for ten days, it is better to lie thirty-six hours ; sow the grain wet from steeping without any addition : the seed will scatter well as clean water has no tenacity ; only the sower must put in a fourth or a third more seed in bulk than is usual of dry grain, as the grain is swelled in that proportion ; harrow it in as quickly as possible after it is sown ; and though not necessary, give it the benefit of a fresh furrow if convenient. You may expect it up in a fortnight at farthest. (*Brown.*)

4677. *The quantity of seed* is different in different cases, according to the quality of the soil and other circumstances. Upon very rich lands, eight pecks per acre are sometimes sown ; twelve is very common ; and upon poor land, more is sometimes given. Among the best farmers, it seems a disputed point whether the practice of giving so small a quantity of seed to the best lands is advantageous. That there is a saving of grain there can be no

doubt; and that the bulk may be as great as if more seed had been sown, there can be as little question. Little argument, however, is necessary to prove that thin sowing of barley must be attended with considerable disadvantage; for if the early part of the season be dry, the plants will not only be stunted in their growth, but will not send out offsets; and, if rain afterwards fall, an occurrence that must take place some time during the summer, often at a later period of it the plants begin to stool, and send out a number of young shoots. These young shoots, unless under very favorable circumstances, cannot be expected to arrive at maturity; or if their ripening is waited for, there will be a great risk of losing the early part of the crop, a circumstance that frequently happens. In almost every instance an unequal sample is produced, and the grain is for the most part of an inferior quality. By good judges, it is thought preferable to sow a quantity of seed sufficient to ensure a full crop, without depending on its sending out offsets; indeed, where that is done, few offsets are produced, the crop grows and ripens equally, and the grain is uniformly good. (*Brown on Rural Affairs.*)

4678. *The modes of sowing barley* are either broad-cast or in rows by the drill or ribbing. The broad-cast mode is almost universally adopted; unless in lands much infested with annual weeds, where drilling and horse-hoeing may be employed with advantage.

4679. *The only culture* which barley requires while in a growing state, is hoeing and weeding if in rows, and weeding alone if broad-cast. Sometimes barley is rolled to compress a soft soil and exclude the drought, and when very thick it may be first harrowed and then rolled. Grass seeds and clover are sown with the grain before the last harrowing, when the broad-cast mode is adopted; and immediately before hoeing, when the barley is in rows. The former is much the best mode for insuring a strong plant of clover.

4680. *Eating down barley*, which from winter or very early sowing is over luxuriant, is practised in some districts, but it is alleged that mowing is much better than feeding it; because the scythe takes off only the rank tops, but the sheep feed upon all indifferently; nor should they even, in any case, be left upon it too long, because, being particularly fond of the sweet end of the stalk next the root, they bite so close as to injure the future growth of the plant.

4681. *Barley is ripe* when the red roan, as the farmers term it, meaning a reddish color on the ear, is gone off, or when the ears droop, and fall, as it were, double against the straw, and the stalks have lost their verdure.

4682. *In the harvesting of barley* more care is requisite than in taking any of the other white crops, even in the best of seasons; and in bad years it is often found very difficult to save it. It is known to be ripe by the ears drooping and falling, as it were, doubly against the straw. Owing to the brittleness of the straw, after it has reached a certain period it must be cut down; as, when it is suffered to stand longer, much loss is sustained by the breaking of the heads. On that account it is cut at a time when the grain is soft, and the straw retains a great proportion of its natural juices, consequently requires a long time in the field before either the grain is hardened, or the straw sufficiently dry. When put into the stack sooner it is apt to heat, and much loss is frequently sustained. Barley is generally cut down in England with the cradle scythe, and either tied up or carted home loose after lying in the swath some days to dry. It is not apt to shed; but in wet weather it will be apt to spout or grow musty; and therefore every fair day after rain it should be shook up and turned; and when it is tolerably dry, let it be made up into shocks; but be careful never to house it till thoroughly dry, lest it mow-burn, which will make it malt worse than if it had spired in the field. It is remarked by Lisle, that poor thin barley should be cut a little sooner than if the same plants were strong and vigorous; as the straw, when the plants are full ripe, in such cases will not stand against the scythe. In this situation, barley in particular should lie in swarth till it is thoroughly dry. Some of his barley, which lay out in swarth five or six days in very fine weather, though both blighted and edge-grown, grew plump, and acquired very near as good a color as the best. He reckons short scythes the best for mowing lodged or crumpled corn, because they miss the fewest plants; and observes, that a bow upon the scythe, which carries away the swarth before it, is preferable to a cradle, the fingers of which would be pulled to pieces by the entangled corn, in drawing back the scythe. In Scotland and Ireland it is generally reaped with the sickle, bound in sheaves and set up in shocks.

4683. *In stacking barley* many farmers make an opening in the stack from top to bottom. This opening is generally made by placing a large bundle of straw in the centre of the stack, when the building commences, and in proportion as it rises, the straw is drawn upwards, leaving a hollow behind; which if one or two openings are left in the side of the stack near the bottom, insures so complete a circulation of air, as not only to prevent heating, but to preserve the grain from becoming musty.

4684. *The threshing and dressing* of barley requires more labor than any other grain, on account of the difficulty of separating the awns from the ears. For this purpose some

threshing machines are furnished with what is called a hummelling machine, already described (2649.); and where this is wanting, it is customary to put the grain, accompanied with a portion of threshed straw, a second time through the machine. Where barley has been mown, the whole of the straw requires to be twice threshed, independently of the necessity of getting rid of the ears.

4685. *The produce of barley*, taking the average of England and the south of Scotland, Donaldson considers, might be rated at thirty-two bushels; but when Wales and the north of Scotland are included, where, owing to the imperfect modes of culture still practised, the crops are very indifferent, the general average over the whole will not probably exceed twenty-eight bushels the acre. Middleton states it as varying in England from fifteen to seventy-five bushels per acre. The average produce of the county of Middlesex, he says, is about four quarters of corn and two loads of straw per acre.

4686. *The uses of barley* are various. In Wales, Westmorland, Cumberland, and in the north, as well as in several parts of the west of Scotland, the bread used by the great body of the inhabitants is made chiefly from barley. Large quantities of the barley cultivated in England are converted into beer, ale, porter, and what is called British spirits, as English gin, English brandy, &c. The remainder, beyond what is necessary for seed, is made into meal, and partly consumed in bread by the inhabitants of the above-mentioned districts, and partly employed for the purpose of fattening black-cattle, hogs, and poultry. There is a much greater share of the Scotch barley consumed in distillation, in proportion to the quantity cultivated, than there is in England. Exclusive of what is used for seed, the Scotch barley is either converted into beer or ale; or made into pot-barley, or into meal, for the use of the inhabitants in the more remote and less cultivated parts of the kingdom; or, lastly, into whisky. In *The Report of Middlesex* it is stated, that much of the most ordinary barley is given to poultry: the rest is sold to the maltsters, except so much as is reserved for seed.

4687. *But malt is the great purpose to which barley is applied* in Britain. To understand the process of malting, it may be necessary to observe that the cotyledons of a seed, before a young plant is produced, are changed by the heat and moisture of the earth into sugar and mucilage. Malting grain is only an artificial mode of effecting this by steeping the grain in water and fermenting it in heaps, and the arresting its progress towards forming a plant by kiln drying, in order to take advantage of the sugar in distillation for spirit or fermentation for beer. The grain of barley contains starch and sugar; and the chemical constituents of both these ingredients are very nearly alike. In the process of malting, a portion of the starch is converted into sugar, so that the total quantity of sugar, and consequently the source of spirit, is increased by the transformation.

4688. *To choose a proper sample of barley for malting*, observe the directions given for choosing seed barley. (4670.)

4689. *Of pot-barley* there are two sorts, 'pearl and Scotch; both are produced by grinding off the husk, and the pearly barley is produced by carrying the operation so far as to produce roundness in the kernel. It is used in soups, gruels, and medicinal drinks.

4690. *Barley meal* is ground like oatmeal or flour; the coarser sort, with the bran, is used for fattening live stock, especially pigs and poultry, but fine bolted barley flour, made into a thin pottage or pudding, and spread out in thick cakes, and toasted on a hot-plate of metal, forms a light breakfast bread, much esteemed in some parts of Scotland. It is served in a recent state, hot, and spread with butter and honey, and eaten in several folds. Two parts of barley flour, one of wheat flour, and one of rye, are said to make a light and very agreeable loaf bread.

4691. *The produce of barley in flour* is 12lbs. to 14lbs. of grain. Sir H. Davy found 1000 parts of barley meal to afford 920 parts of soluble or nutritious matter, viz. 790 of mucilage or starch, 70 of sugar, and 60 of gluten.

4692. *Barley straw* is chiefly used for litter and packing; it is unfit for thatch or rope making, and of little value as fodder.

4693. *The diseases of barley* are few, and chiefly smut, which it is found cannot be prevented by pickling and liming.

SECT. IV. *The Oat.*—*Avena Sativa*, L. *Trian. Dig. L.* and *Graminea*, J. *L' Avoine*, Fr.; *Haber*, Ger.; and *Vena*, Ital.

4694. *The oat* is a very useful grain, and more peculiarly adapted for northern climates than either wheat, rye, or barley. Its native country is unknown, unless the wild oat be considered as the parent species, which is highly probable. The culture of the oat is chiefly confined to latitudes north of Paris. It is scarcely known in the south of France, Spain, or Italy; and in tropical countries, its culture is not attended to. In Britain it has long been very generally cultivated, formerly as a bread corn, but now chiefly as horse food. Of all the grain this is the easiest of culture, growing in any soil that admits of ploughing and harrowing.

4695. *The varieties of oats are more numerous than of the other grains, and some of them very distinctly marked. The principal are as follow :*

4696. *The white oat or common oat (fig. 556 a) in most general cultivation both in England and Scotland, and known by its white husk and kernel.*

4697. *The black oat, known by its black husk ; cultivated on poor soils, in the north of England.*

4698. *The red oat, known by its brownish red husk, thinner and more flexible stem, and firmly attached grains. It is early, suffers little from winds, meals well, and suits windy situations and late climates. It is understood to have been originated in Peebleshire, on the estate of Magbie-hill, by which name it is sometimes known.*

4699. *The Poland oat, known by its thick white husk, awnless chaff, solitary grains, short white kernel, and short stiff straw. It requires a dry warm soil, but is very prolific.*

4700. *The Fricland or Dutch oat, has plump thin-skinned grains, mostly double, and the large one sometimes awned. It has longer straw than the Poland, but in other respects resembles it.*

4701. *The potatoe oat has large, plump, rather thick-skinned grains, double and treble, with longer straw than either of the two last sorts. It is almost the only oat now raised on land in a good state of cultivation in the north of England and south of Scotland, and usually brings a higher price in the London market than any other variety. It was discovered growing in a field of potatoes in Cumberland, in 1788, and from the produce of the single stalk which there sprung up by accident, probably from the manure, has been produced the stock now in general cultivation.*

4702. *The Siberian or Tatarian oat (b), is considered by some as a distinct species. The grains are thin and small, and turned mostly to one side of the panicle, and the straw is coarse and reedy. It is little cultivated.*

4703. *There are various other varieties, as Church's oat, the Angus oat, the dun oat, &c., but they are either too local or obsolete to require particular notice. In the oat, as in other plants extensively cultivated, new varieties will always be taking place of old ones.*

4704. *To procure new varieties adopt the mode by selection, by which, as appears above, the potatoe and red oat were brought forward ; or proceed systematically by cross impregnation, as directed for raising new varieties of wheat. Degeneracy, Brown observes, has taken place to a certain extent in the potatoe oat ; but it is presumed that the consequences might be removed with ease, were first principles returned to. To make a selection of the strongest ears, which carried the purest grain, is not a difficult business ; and were this selection attended to by half a dozen farmers in a district, it is obvious, that the breed, or variety, might be preserved pure and uncontaminated. If slovenly farmers were not provided with good seed, it would be their own fault, since, if they would not take the trouble to select and breed for their own use, they might always be provided by those who were either better qualified for making the selection, or were more attentive to the interests of agriculture. (Brown.)*

4705. *In choosing a sort from among the varieties described, the potatoe and Poland, are the best for lowlands, and the red oat for uplands, and late climates in a state of good cultivation. For inferior soils the white or common oat, and for the poorest of all the black oat may be adopted.*

4706. *The soil for oats may be any kind whatever, from the stiffest clays to moss or bog, provided it be laid sufficiently dry. The most tenacious clays, and meagre gravels and sands, where scarcely any useful seed-bearing plant, excepting buck-wheat, could be grown, will produce a crop of oats if ploughed at a proper season, and the seed judiciously sown and covered.*

4707. *The preparation of the soil for oats is less than for any other grain. It is almost always the first crop on newly-broke up lands ; and as it prospers best on a soil not too finely pulverised, it is commonly sown on one earth. In regular rotations, oats are chiefly sown after grass ; sometimes upon land not rich enough for wheat, that had been previously summer-fallowed, or had carried turnips ; often after barley, and rarely after wheat, unless cross-cropping, from particular circumstances, becomes a necessary evil. One ploughing is generally given to the grass-lands, usually in the month of January, so that the benefit of frost may be gained, and the land sufficiently mellowed for receiving the harrow. In some cases, a spring furrow is given when oats succeed wheat or barley, especially when grass-seeds are to accompany the crop. The best oats, both in quantity and quality, are always those which succeed grass ; indeed, no kind of grain seems better qualified by nature for foraging upon grass-land than oats ; as a full crop is usually obtained in the first instance, and the land left in good order for succeeding ones. (Tr. on Rural Affairs.)*

4708. *The climate for oats should be cool and moist ; when dry and warm, the panicles are so dried and contracted, that they cease to convey sufficient nourishment to the ears, which thus never become plump, but thick husked, long awned, and unproductive in meal. This is very often the case with the oats in Scotland in a very dry year, and very common in the south of England most years.*



4709. *The season of sowing oats* is from the last week in February to the end of April. About the middle of March is preferred by the best farmers. No preparation is ever given to the seed; but it should be plump, fresh, and free from the seeds of weeds. Oats sown in autumn are generally killed during winter, the plant being in this respect more tender than wheat, rye, or barley bigg.

4710. *The quantity of seed*, where oats are sown broad-cast, is usually from four to six bushels to the acre. Land sown with potatoe oats requires less seed, in point of measure, than when any of the other sorts are used; first, because this variety tillers better than any other, and next, because having no awn, a greater number of grains are contained in a bushel.

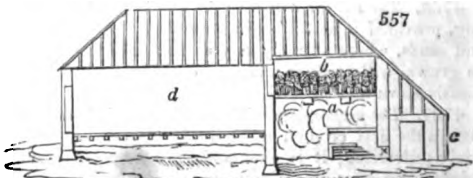
4711. *The mode of sowing oats* is almost universally broad-cast; but where they are sown after turnips, or on other well pulverised soils, some adopt the row culture.

4712. *The after-culture* depends on the mode of sowing, but seldom consists of more than weeding before the flower-stalks begin to shoot up.

4713. *In harvesting oats* in England, they are generally cut down with the scythe and carried loose to the barn or stack; but in the northern districts, and where threshing machines are used, they are tied into sheaves if mown, but, for the most part, reaped with the sickle, in order in both cases to facilitate the process of threshing. Oats are ready for the scythe or sickle when the grain becomes hard, and the straw yellowish. They should generally be cut before they are dead ripe, to prevent the shedding of the grain, and to increase the value of the straw as fodder. They rarely get much damage when under the harvest process, except from high winds, or from shedding, when opened out after being thoroughly wetted. The early varieties are much more liable to these losses than the late ones; because the grain parts more easily from the straw, an evil to which the best of grain is at all times subject. Early oats, however, may be cut a little quick, which, to a certain extent, lessens the danger to which they are exposed from high winds; and if the sheaves be made small, the danger from shedding after rains is considerably lessened, because they are thus sooner ready for the stack. Under every management, however, a greater quantity of early oats will be lost during the harvest process than of the late ones, because the latter adhere firmly to the straw, and consequently do not drop so easily as the former. (*Brown.*) In harvesting oats in wet seasons, the practice of gaiting the sheaves (2940.) is generally adopted. In Sweden, in most seasons, the oat crop is dried on frames or poles (683.), and in Russia, not only oats, but barley and rye are kiln-dried in the straw.

4714. *Kiln-drying oats and other corns in the straw* has been found necessary, and is very generally practised through the north of Russia, Livonia, Courland, and Lithuania, being the last operation of harvest for preserving all kinds of corns, pease, beans, and buck-wheat. They are dried in the fields as much as can be; but, when brought home, they are kiln-dried, and are then ready to be either threshed out immediately, or put up in barns, without any danger of either corn or straw becoming musty or rotting. The common practice of the boors is, during winter, to thresh out by degrees, as in this country, their oats and barley, in order to have straw fresh for their cattle, such straw being their only provender. The process of kiln-drying by no means prevents the germination of the grain when used for seed, while it not only preserves the grain and straw, but improves their taste and salubrity. It enables Russia to export large quantities of rye and wheat with less risk of damage to the grain, than is incurred by other nations of the north of Europe.

4715. *The kiln* (fig. 557.) in general and established use throughout Russia, for the purpose of drying corn in the straw, is heated commonly by fires of wood. It is a simple and cheaply-erected structure, the walls eight feet high, and fifteen feet square within: At this height there are two strong cross beams (a), to support the small timbers, laid over them as ribs. The corn stands in sheaves above these ribs (b), closely set up, the band ends of the sheaves down, and the corn or grain ends up: the walls then rise above the ribs about five or six feet more, the kiln being closed by a simple ceiling of cross joists at this height, covered with thin turf. Any cheap and ordinary roof answers to cover the whole. The fire-place is constructed so as to throw back the ascending spark; a small porch (c), directly opposite to the fire-place, prevents violent blasts of wind, and covers from rain the fuel and the attendant. About 300 sheaves (twenty-five stooks) of corn are dried at one time. It is put on in the evening, and left on the kiln through the night, after the wood has been burned into charcoal, and the door above the fire-place closed. At one end of the kiln there is frequently an open shed or barn (d), for convenience in bringing corn to, or taking it from the kiln.



4716. *The produce of oats* is generally considered greater and of better quality in the northern than in the southern counties; and the reasons are obviously that, in the latter, more attention is paid to their culture, and the climate is more favorable for the maturation of the grain. Ten quarters an acre is reckoned a good crop in the north, but the produce is often twelve and thirteen quarters, and the straw from two to three and a half loads per acre.

4717. *The produce of oats in meal* is 8 lbs. for 14 lbs. of corn. Sir H. Davy found 100 parts of oats afford 59 parts of starch, six of gluten, and two of saccharine matter.

4718. *The use of oats in the north, in Ireland, and in some parts of Yorkshire and Derbyshire, is partly for meal and partly for horse food. In the south it is almost entirely for horse-food, poultry, and groats for gruel. It is occasionally malted and used in distillation. The fine powder which is produced by husking the corn, or making grist, forms the sowens of the Scotch (the flumerty of the Irish) an agreeable light and wholesome supper dish.*

4719. *The diseases of the oat are few. Sometimes it is found attacked by the smut; but the more common injury sustained by oats is from wire-worm, or larva of insects which generally abound in lands newly broken up from turf. One of the most certain practices of avoiding these is, by not ploughing the ground, especially if old turf, till immediately before sowing. By this means the insect is turned down, and before it can work its way to the surface (if ever it does), the corn is beyond its reach. In this way gardeners destroy and retard the progress of the gooseberry caterpillar by digging under the bushes, for it is found that the eggs and larvæ of insects, like seeds and bulbs, when buried too deep in the ground, have their progress retarded, or their vital principle destroyed. (Encyc. of Gard. 4663.)*

SECT. V. *Cereal Grasses cultivated in Europe, some of which might be tried in Britain.*

4720. *The cereal grasses which the climate of Britain does not readily admit of cultivating, are the millet, maize, and rice.*

4721. *Of the millet there are three distinct genera, the Polish millet (*Digitaria*), cultivated in Poland; the common millet (*Panicum*), or panic grass, cultivated in Germany, and sometimes in this country; and the great or Indian millet (*Holcus*), cultivated in India, Italy, and America.*

4722. *Of the common millet there are three species, the Panicum Germanicum (fig. 558 a), a native of the south of Europe; the P. miliaceum (b), a native of the East Indies; and the P. Italicum (c), also of Indian origin.*

4723. *The common or German millet (*Panicum Germanicum*, a), rises with a jointed reed-like stalk, about three feet high, and about the size of the common reed, with a leaf at each joint a foot and a half long, and about an inch broad at the base where broadest, ending in an acute point, rough to the touch, embracing the stalk at the base, and turning downwards about half the length. The stalks are terminated by compact spikes, about the thickness of a man's finger at bottom, growing taper towards the top, eight or nine inches long, closely set with small roundish grain. It is annual, and perishes soon after the seeds are ripe. There are three varieties of it, with yellow, white, and purple grains. It has been formerly cultivated for bread in some of the northern countries.*

4724. *The cultivated millet (*Panicum miliaceum*, b), rises with a reed-like channelled stalk, from three to four feet high; at every joint there is one reed-like leaf, joined on the top of the sheath, which embraces and covers that joint of the stalk below the leaf, and is clothed with soft hairs; the leaf has none, but has several small longitudinal furrows running parallel to the midrib. The stalk is terminated by a large loose panicle hanging on one side. Of this species there are two varieties, the brown and yellow; the latter of which was formerly in cultivation, and is now sometimes sown for feeding poultry, and as a substitute for rice.*

4725. *The Italian millet (*Panicum Italicum*, c), rises with a reed-like stalk, near four feet high, and much thicker than that of the preceding; the leaves are also broader. The spikes are a foot long, and twice the thickness of those of the common millet, but not so compact, being composed of several roundish clustered spikes; the grain is also larger. There are two or three varieties of this, differing only in the color of the grain. It is frequently cultivated in Italy (whence its trivial name), and other warm countries. It is a native of both Indies, and of Cochin China.*

4726. *The Polish millet, or manna grass of the Germans (*Digitaria sanguinalis*, formerly *Panicum sanguinale*, fig. 559), is a low decumbent annual plant, seldom rising above nine inches or a foot high, with hairy leaves and slender panicles. It tillers much, and forms a close tuft, spreading and rooting at the joints. It is a native of England but not common, but grows in abundance in Poland, and is sometimes cultivated; the seeds being used like those of the other millets as a substitute for rice or sago.*

4727. *The great or Indian millet (*Holcus sorghum*, 1. *Sorghum vulgare*, W. en. fig. 560. *Honque sorgo*, Fr.; *Sorgamen*, Ger.; *Sagina*, Ital.; and *Melona*, Span.), has a stem which rises five or six feet high, is strong, reedy, and like those of the maize, but smaller. The leaves are long and broad, having a deep furrow through the centre;*



where the mid rib is depressed in the upper surface, and is very prominent below. The leaves are two feet and a half long, and two inches broad in the middle, embracing the stalks with their base. The flowers come out in large panicles at the top of the stalks, resembling at first appearance the male spikes of the Turkey wheat; these are succeeded by large roundish seeds, which are wrapped round with the chaff. This grain is a native of India, where it is much used to feed poultry, and is frequently sent to Europe for the same purpose. It is much cultivated in Arabia, and most parts of Asia Minor; and has been introduced into Italy, Spain, Switzerland, and some parts of Germany, also into China, Cochinchina, and the West Indies, where it grows commonly five or six feet high, or more, and being esteemed a hearty food for laborers, is called negro guinea corn. Its long awns or bristles defend it from the birds. In England, the autumn is seldom dry and warm enough to ripen the seed well in the field. In Arabia it is called *dora* or *darra*; the flour is very white, and they make good bread of it, or rather cakes, about two inches in thickness. The bread which they make of it in some parts of Italy is dark and coarse. In Tuscany it is used chiefly for feeding poultry and pigeons, sometimes for swine, kine, and horses. Cæsalpinus says, that cattle fed on the green herb are apt to swell and die, but thrive on it when dried. They make brushes and brooms of its stalks in Italy, which are sent to this country, which Ray observed in the shops at Venice. Of this species there are two distinct varieties, known by their black and red husked seeds, besides subvarieties.

4728. *The only sorts of millet which can be cultivated with success in this country, are the German, cultivated, and the Polish sorts. According to Professor Thær, the cultivated is to be preferred, as having the largest grain.*

4729. *The soil for the millet should be warm, sandy, rich, and well pulverised to a good depth. The seed is sown in May, very thin, and not deeply covered. In the course of its growth, no plant, Professor Thær observes, is more improved by stirring the soil, after which it grows astonishingly fast, and smother all weeds.*

4730. *In harvesting the millet, great care is requisite not to shed the seed; and as it ripens rather unequally it would be an advantage to cut off the spikes as they ripen, as is done in reaping maize. No grain is easier to thresh, or to free from its husk by the mill. It is used instead of rice, and in Germany bears about the same price. It produces a great bulk of straw, which is much esteemed as fodder.*

4731. *The great Indian millet will grow in this country to the height of five or six feet, but will not ripen its seeds or even flower if the season is not dry and warm. If its culture is attempted, it should be raised in a hot bed and transplanted.*

4732. *The Zizania aquatica (fig. 561.) might be cultivated on the margin of ponds for its seeds, which much resemble those of Polish millet. It is exceedingly prolific, grows in great luxuriance and produces abundance of bland farinaceous seeds, in all the shallow streams of the dreary wilderness in north-west America, between the Canadian lakes and the hilly range which divides Canada from the country on the Northern Pacific ocean. Its seeds contribute essentially to the support of the wandering tribes of Indians, and feed immense flocks of wild swans, geese, and other water-fowl, which resort there for the purpose of breeding. Productive as is this excellent plant, and habituated to an ungenial climate, and to situations which refuse all culture, it is surprising, says Pinkerton (*Geog.* vol. ii. 330.), that the European settlers in the more northern parts of America, have as yet taken no pains to cultivate and improve a vegetable production, which seems intended by nature to become, at some future period,*

the bread-corn of the north.

4733. *The festuca fluitans resembles the zizania, and the seeds are used in Germany like those of Polish millet. Various species of panicum, hordeum, and bromus, afford tolerable supplies of edible seeds.*

4734. *The maize or Indian corn (Zea mays, fig. 192.) may be cultivated in this country in very dry, warm situations, especially if the dwarf red-grained variety be adopted. The straw forms an excellent fodder, and the grain as a bread-corn is much liked by some, but though it abounds in mucilage it contains little or no gluten, and is not likely to be much used by those who can procure wheaten or even rye bread.*

4735. *The rice (Oriza sativa, fig. 562.) has been tried in this country, and if sown very early, would probably ripen its seeds. The hill variety, which does not require watering, would probably succeed best. But there is no inducement to cultivate this and other grains or seeds when they can be imported at so low a rate. We merely introduce them to record the resources of British agriculture in case of necessity.*

4736. *The back-wheat (Fagopyrum) is vulgarly considered as a grain; and the canary grass (Phalaris) is a gramin cultivated for its seed; but neither being bread-corn grasses, we have classed them among manufactory plants. (Chap. VIII. Sect. IV.)*



CHAP. III.

Of the Culture of Leguminous Field-Plants.

4737. *The seed of the cultivated legumes* are considered to be the most nutritive of vegetable substances grown in temperate climates. They contain a large proportion of matter analogous to animal substances, having when dry the appearance of glue, and equally nourishing as gluten. To the healthy workman this substance supplies the place of animal food; and Von Thaer states, that in Germany neither sailors nor land laborers are content, unless they receive a meal of legumes at least twice a week. The straw or haulm, he says, cut before it is dead ripe is more nourishing than that of any of the cereal grasses. But leguminous plants are not only more than all others nourishing to man and animals, but even to vegetables they may be said to supply food; since they are not only known to be less exhausting to the soil than most other plants, but some of them, and more especially the lupin, have been ploughed in green as manure from the earliest times. Many scientific agriculturists consider a luxuriant crop of pease or tares as nourishing the soil by stagnating carbonic acid gas on its surface; which corresponds with the universal opinion of their being equal to a fallow, and with the value set on them in rotation, as already explained (4563). The legumes cultivated in British farming are the pea, bean, tare, and vetch, to which might be added the lentil, kidneybean, and chick pea.

4738. *The nutritive products* of these plants is thus given by Sir H. Davy, Einhoff, and Thaer:

Systematic name.	The quantity analysed, of each sort 1000 parts.	Whole quantity of soluble or nutritive matter.	Mucilage or starch.	Saccharine matter or sugar.	Gluten or albumen	Extract, or matter rendered insoluble during evaporation.
<i>Pisum sativum</i> - -	Dry pease - -	574	501	22	35	16
<i>Vicia faba</i> - - -	Common bean - -	570	426	—	103	41
<i>sativa</i> - - -	Tares - - -	65	36	—	29	—
<i>Ervum lens</i> - - -	Lentils - - -	71	39	—	32	—
<i>Phaseolus vulgaris</i> -	Kidneybean - -	89	67	—	22	—

SECT. I. *The Pea.*—*Pisum sativum*, L. *Diadel. Decan. L. and Leguminosæ, J. Les Pois, Fr. ; Erbse, Ger. and Piscello, Ital. (fig. 563.)*

4739. *The pea is the most esteemed legume in field cultivation* both for its seed and haulm. It is supposed to be a native of the south of Europe, and was cultivated by the Greeks and Romans, and in this country from time immemorial, though its culture appears to have diminished since the more general introduction of herbage plants and roots; and excepting near large towns for gathering green, and in a few places for boiling the pea, has given way to the bean or to a mixture of pease and beans. There are various inducements, however, to the cultivation of pease in dry warm soils near large towns. When the crop is good and gathered green, few pay better: the payment is always in cash, and comes into the pocket of the farmer in time to meet the exigencies of the hay, and sometimes even of the corn harvest. The ground after the pease have been removed is readily prepared for turnips, which also pay well as a retail crop near towns; and the haulm is good fodder.

4740. *The varieties of the pea* are numerous; but they may be divided into two classes; those grown for the ripened seed, and those grown for gathering in a green state. The culture of the latter is chiefly near large towns, and may be considered as in part belonging to gardening rather than agriculture.

4741. *The grey varieties* are, the early grey, the late grey, and the purple grey; to which some add the Marlborough grey, and horn grey.

4742. *The white varieties* grown in fields are the pearl, early charlton, golden hotspur, the common white or Suffolk, and other Suffolk varieties.

4743. *New varieties* of the pea are readily procured by selection or impregnation, of which a striking example given by Knight has been already referred to. (1599.)

4744. In the choice of sorts, where it is desired to grow grey pease for the sake of the seeds or corn, the early variety is to be preferred in late situations, and the late variety in



early ones ; but when it is intended to grow them chiefly for covering the ground and for the haulm, then the late varieties claim the preference, and especially the purple grey. Of white pease, to be grown for gathering green, the Charlton is the earliest, and the pearl or common Suffolk the most prolific. When white pease are grown for boilers, that is for splitting, the pearl and Suffolk are also the best sorts. It is supposed by some to be of considerable importance in the economy of a farm, when the nature of the soil is suitable, to have recourse to the early sorts ; as by such means the crops may in many cases be cut and secured while there is leisure, before the commencement of the wheat harvest. And that where the nature of the soil is dry and warm, and the pea crop of a sufficiently forward kind, it may be easy to obtain a crop of turnips from the same land in the same year, as has been suggested above. But in this view it is the best practice to put the crops in in the row method, and keep them perfectly clean by means of attentive hand and horse hoeing ; as in that way the land will be in such a state of preparation for the turnips, as only to require a slight ploughing, which may be done as fast as the pea crop is removed, and the turnip seed drilled in as quickly as possible upon the newly turned up earth. In some particular districts a third crop is even put into the same land, the turnips being sold off in the autumn and replaced by coleworts, for the purpose of greens in the following spring. This, according to Middleton, is the practice in some places in Middlesex. But it is obviously a method of cultivation that can only be attempted on the warm and fertile kinds of turnip soil, and where the pea crops are early ; on the cold heavy and wet descriptions of land, it is obviously impracticable, and wholly improper.

4745. The soil best suited for pease is a dry calcareous sand ; it should be in good tilth, not too rich nor dunged along with the crop. In Norfolk and Suffolk pease are often sown on clover leys after one furrow, or after corn crops on two furrows, one given in autumn, and the other early in spring.

4746. The climate required by the pea is dry and not over warm, for which reason, as the seasons in this country are very often moist and sometimes exceedingly dry and hot in June and July, the pea is one of the most uncertain of field crops.

4747. The season of sowing must differ considerably according to the intentions of the cultivator. When they are grown for podding early for sale green, they should be sown at different times, from January to the end of March, beginning with the driest and most reduced sorts of land ; and in this intention in some southern counties they are put in in the autumn. For the general crops from February to April, as soon as the lands can be brought into proper order is the proper season ; the grey sorts being employed in the early sowings, and the white sorts in the later. Young says, that where these crops cannot be put in in February, they should always be completed in the following month. It is observed by the same writer, in sowing on layers, that the white boiling pea, of many sorts and under various names, is more tender than the greys, and various kinds of hog pease ; but he has many times put them into the ground in February, and though very smart frosts followed, they received no injury. He has uniformly found, that the earlier they were sown the better. There is also a particular motive for being as early as possible : that is, to get them off in time for turnips. This is most profitable husbandry, and should never be neglected. If they are sown in this month and a right sort chosen, they will be off the land in June, so that turnips may follow at the common time of sowing that crop.

4748. *Steeping the seed in water* is sometimes practised in late sowings.

4749. The quantity of seed must be different in different cases and circumstances, and according to the time and manner in which the crop is put into the ground ; but in general, it may be from two and a half to three bushels, the early sowings having the largest proportion of seed. In planting every flag, Young says, two bushels and a half is the usual proportion ; but when drilled at greater distances, six or seven pecks will answer.

4750. The most common mode of sowing pease is broad-cast ; but the advantages of the row culture in the case of a crop so early committed to the soil must be obvious. The best farmers therefore always sow pease in drills either after the plough, the seed being deposited commonly in every second or third furrow, or if the land is in a pulverised state by drawing drills with a machine or by ribbing. In Norfolk and Suffolk pease are generally dibbled on the back of the furrow, sometimes one and sometimes two rows on each ; but dibbling in no manner appears to us so well suited for a farmer's purpose as the drill. In Kent, where immense quantities of pease are grown both for gathering green and for selling ripe to the seedsmen, they are generally sown in rows from eighteen inches to three feet asunder, according to the kind, and well cultivated between. Pease laid a foot below the surface will vegetate ; but the most approved depth is six inches in light soil, and four inches in clay soil, for which reason they ought to be sown under furrow when the ploughing is delayed till spring. Of all gain, beans excepted, they are the least in danger of being buried.

4751. *The after culture given to pease is that of hoeing, either by hand or horse.* Where the method of hand-culture prevails, it is the general custom to have recourse to two hoeings; the first when the plants are about two or three inches in height, and again just before the period in which they come into blossom. In this way the vigorous vegetation of the young crop is secured, and a fresh supply of nourishment afforded for the setting of the pods and the filling of the pease. At the last of these operations the rows should be laid down, and the earth well placed up to them, the weeds being previously extirpated by hand labor. It has been stated, that in some parts of Kent, where this sort of crop is much grown, it is the practice, when the distance of the rows is sufficiently great, to prevent the vegetation of weeds, and forward the growth of pea crops, by occasionally horse-hoeing, and the use of the brake-harrow, the mould being laid up to the roots of the plants at the last operation by fixing a piece of wood to the harrow. This should, however, only be laid up on one side, the pease being always placed up to that which is the most fully exposed to the effects of the sun.

4752. *In harvesting the ripened pea* considerable care is requisite, both on account of the seed and haulm. When pea crops become ripe they wither and turn brown in the haulm or straw, and the pods begin to open. In this state they should be cut as soon as possible, in order that there may be the least loss sustained by their shedding. It is observed that in the late or general crops, after they are reaped or rather cut up by means of a hook, it is the usual practice to put them up into small heaps, termed wads, which are formed by setting small parcels against each other, in order that they may be more perfectly dried both in the seed and stem, and be kept from being injured by the moisture of the ground. But in the early crops, the haulm is hooked up into loose open heaps, which, as soon as they are perfectly dry, are removed from the ground and put into stacks for the purpose of being converted to the food of animals, on which they are said to thrive nearly as well as on hay. When intended for horses, the best method would seem to be that of having them cut into chaff and mixed with their other food. Young says, that forward white pease will be fit to cut early in July; if the crop is very great they must be hooked; but if small, or only middling, mowing will be sufficient. The stalks and leaves of pease being very succulent, they should be taken good care of in wet weather: the tufts, called wads or heaps, should be turned, or they will receive damage. White pease should always be perfectly dry before they are housed, or they will sell but indifferently, as the brightness and plumpness of the grain are considered at market more than with hog-pease. The straw also, if well harvested, is very good fodder for all sorts of cattle and for sheep; but if it receives much wet, or if the heaps are not turned, it can be used only to litter the farmyard with. It is the practice in some districts to remove the haulm as soon as it has been cut up by hooks constructed with sharp edges for the purpose, to every fifth ridge, or even into an adjoining grass field, in order that it may be the better cured for use as cattle food, and at the same time allow of the land being immediately prepared for the succeeding crop. When wet weather happens whilst the pease lie in wads, it occasions a considerable loss, many of them being shed in the field, and of those that remain a great part will be so considerably injured, as to render the sample of little value. This inability in pease to resist a wet harvest, together with the great uncertainty throughout their growth, and the frequent inadequate return in proportion to the length of haulm, has discouraged many farmers from sowing so large a portion of this pulse as of other grain; though on light lands which are in tolerable heart, the profit, in a good year, is far from inconsiderable.

4753. *In gathering green pease for the market,* it is frequently a practice with the large cultivators of early green pea crops in the neighborhood of London, to dispose of them, by the acre, to inferior persons, who procure the podders; but the smaller farmers, for the most part, provide this description of people themselves, who generally apply at the proper season for the purpose. The business of picking or podding the pease is usually performed by the laborers at a fixed price for the sack, of four heaped bushels. The number of this sort of persons is generally in the proportion of about four to the acre, the labor proceeding on the Sundays as well as other days. It is sometimes the custom to pick the crops over twice, after which the rest are suffered to stand till they become ripe for the purpose of seed. This, however, mostly arises from the want of pickers, as it is considered as a loss, from the pease being less profitable in their ripe state than when green. Besides, they are often improper for the purpose of seed, as being the worst part of the crop. It is therefore better to have them clear picked when hands can be procured. After this they are loaded into carts, and sent off at suitable times, according to the distance of the situation, so as to be delivered to the salesmen in the different markets from about three to five o'clock in the morning. In many cases in other parts, the early gatherings are, however, sent to the markets in half-bushel sieves, and are frequently disposed of at the high price of five shillings the sieve; but at the after periods they are usually conveyed in sacks of a narrow form, made for the purpose, which contain about three bushels each, which, in the more early parts of the season, often fetch twelve or fourteen shillings the

sack, but afterwards mostly decline considerably; in some seasons so much as scarcely to repay the expenses. This sort of crop affords the most profit in such pea seasons as are inclined to be cool, as under such circumstances the pease are most retarded in their maturation or ripening, and of course the markets kept from being over abundantly supplied.

4754. *The threshing of pease* requires less labor than that of any other crop. Where the haulm is wished to be preserved entire it is best done by hand; as the threshing-machine is apt to reduce it to chaff. But where the fodder of pease is to be given immediately to horses on the spot, the breaking it is no disadvantage.

4755. *The produce of the pea* in ripened seeds is supposed by some to be from three and a half to four quarters the acre; others, however, as Donaldson, imagine the average of any two crops together not more than about twelve bushels; and that on the whole, if the value of the produce be merely attended to, it may be considered as a less profitable crop than most others. But as a means of ameliorating and improving the soil at the same time, it is esteemed as of great value.

4756. With respect to *the produce in green pease* in the husk, the average of the early crops in Middlesex is supposed to be from about twenty-five to thirty sacks the acre, which, selling at from eight to eighteen shillings the sack, afford about eighteen pounds the acre. The author of *The Synopsis of Husbandry*, however, states the produce about Dartford, in the county of Kent, at about forty sacks the acre, though, he says, fifty have sometimes been gathered from that space of land.

4757. *The produce of pease in straw* is very uncertain, depending so much on the sort and the season: in general it is much more bulky than that of the cereal grasses; but may be compressed into very little room.

4758. *The produce of pease in flour* is as 3 to 2 of the bulk in grain, and husked and split for soups as 4 to 2. A thousand parts of pea flour afforded Sir H. Davy 574 parts of nutritive or soluble matter, viz. 501 of mucilage or vegetable animal matter, 22 of sugar, 35 of gluten, and 16 of extract or matter rendered insoluble during the operation.

4759. *The use of pease* for soups, puddings, and other culinary purposes, is well known. In some places porridge, brose, and bread is made of pease-flour, and reckoned very wholesome and substantial. In Stirlingshire it is customary to give pease or bean biscuits to horses while in the yoke as a refreshment. The portion of pease that is not consumed as human food is mostly appropriated to the purposes of fattening hogs and other sorts of domestic animals; and, in particular instances, supplies the place of beans, as the provender of laboring horses; but, care should be taken, when used in this way, that they be sufficiently dry, as, when given in the green state, they are said to produce the gripes, and other bowel complaints, in those animals. Bannister, after observing that the haulm is a very wholesome food for cattle of every kind, says, there is generally a considerable demand for pease of every denomination in the market, the uses to which they may be applied being so many and so various. The boilers, or yellow pease, always go off briskly; and the hog-pease usually sell for 6d. or 1s. per quarter more than beans. For feeding swine the pea is much better adapted than the bean, it having been demonstrated by experience, that hogs fat more kindly when fed with this grain than on beans; and, what is not easy to be accounted for, the flesh of swine which have been fed on pease, it is said, will swell in boiling, and be well tasted; whilst the flesh of the bean-fed hog will shrink in the pot, the fat will boil out, and the meat be less delicate in flavour. It has, therefore, now become a practice with those farmers who are curious in their pork, to feed their hogs on pease and barley-meal, and if they have no pease of their own growth, they rather choose to be at the expense of buying them, than suffer their hogs to eat beans. Nay, so far, says he, do some of them carry their prejudice in this particular, as to reject the grey pease for this use, as bearing too near an affinity to the bean, and therefore reserve their growths of white pease solely for hog fattening.

4760. *In boiling split pease*, some samples, without reference to variety, fall or moulder down freely into pulp, while others continue to maintain their form. The former are called boilers. This property of boiling depends on the soil; stiff land, or sandy land, that has been limed or marled uniformly, produces pease that will not melt in boiling, no matter what the variety may be.

4761. *Pease straw cut green* and dried is reckoned as nourishing as hay, and is considered as excellent for sheep.

4762. In the *saving of any particular sorts of pease for seed*, they should be carefully looked over while in flower, in order to draw out all such plants as are not of the right sort; as there will always be, in every sort, some roguish plants, which, if left to mix, will degenerate the kind. As many rows as may be thought sufficient to furnish the desired quantity of seed should then be marked out, and left till their pods turn brown, and begin to split, when they should immediately be gathered up, with the haulm; and if the farmer has not room to stack them till winter, they may be threshed out as soon as

they are dry, and put up in sacks for use: but particular care should be taken not to let them remain too long abroad after they are ripe; as wet would rot them; and heat, after a shower of rain, make their pods burst in such a manner that the greater part of their seeds would be lost.

4763. *The diseases of pease are few, and chiefly the worm in the pod and the fly on the leaves and flower. They are also liable to be mildewed or blighted. None of these evils, however, are very common; and there is no known way of preventing them but by judicious culture.*

SECT. II. *The Bean. — Vicia Faba, L. Diad. Dectn. L. and Leguminosæ, J. Fève de marais, Fr.; Bohn, Ger.; and Fava, Ital.*

4764. *The bean is a valuable field plant, as affording food for live stock, and in part for man. It is said to be a native of Egypt; but, like other long domesticated plants, its origin is very uncertain. It has been cultivated in Europe and Asia time out of mind: beans have been long known in Britain, but it is only of late years that they were extensively cultivated upon general soils, being formerly considered as adapted only to rich and moist clays. At that time they were all sown according to the broad-cast system; in which way, instead of benefiting the ground, they were of incalculable detriment. Weeds got away at the outset, and, in dry seasons, often ruined the crop; whilst in every season, the grass or perennial weeds, which happened to be in the ground, increased in strength and in quantity, the openness of the bean crop at bottom allowing them to thrive without interruption.*

4765. *The drilling of beans with a small mixture of pease is now become a general practice in every well cultivated district, more particularly in those where soil and climate permit the practice to be successfully executed. In this way not only heavy crops are raised, but, what is of great importance, the ground is kept constantly in good order, provided suitable attention is bestowed upon the cleaning process. This is generally carried on by horse-hoeing the crop at different times, so long as the hoe can be used without doing damage; and in this way, an able auxiliary is brought forward to the assistance of summer fallow, whereby less stress need be laid upon that radical process than otherwise would be indispensably necessary. (Brown.)*

4766. *The varieties of the bean may be included under two general heads, the white or garden beans, and the grey or field beans. Of the white beans sown in the fields, the Mazagan and long-pod are almost the only sorts. Of the grey beans, that known as the horse-bean, the small or ticks, and the prolific or Heligoland, are the chief sorts. New varieties are procured in the same manner as in other plants.*

4767. *In the choice of sorts, tick beans are supposed by some farmers to be more productive than horse-beans; but the latter grow higher in the stem, and produce a more stagnated state of the air, or smother the land more, consequently are the most suitable for the stronger sorts of soil; and Young remarks, that "the common little horse-bean has the advantage of all others in being more generally marketable; for, in certain situations, it is not always easy to dispose of ticks, Windsors, long-pods, and various other large sorts. They also grow higher, shade the ground in summer more from the sun, and yield a larger quantity of straw, which makes excellent manure. But some of the other sorts are generally supposed to yield larger products. In purchasing beans for seed, care should be taken to choose such as are hard and bright, without being shrivelled in their appearance."*

4768. *The best soils for beans are clays and strong loams: on such soils they generally succeed wheat or oats, but sometimes also clover leys. Turnip soils or sands are by no means proper for them.*

4769. *In the preparation of the soil, much depends on the nature of the land and the state of the weather; for as beans must be sown early in the spring, it is sometimes impossible to give it all the labor which a careful farmer would wish to bestow. It must also be regulated, in some measure, by the manner of sowing. In all cases it ought to be ploughed with a deep furrow after harvest, or early in winter: and as two ploughings in spring are highly advantageous, the winter furrow may be given in the direction of the former ridges, in which way the land is sooner dry in spring than if it had been ploughed across. The second ploughing is to be given across the ridges, as early in spring as the ground is sufficiently dry; and the third furrow either forms the drills, or receives the seed. (Supp. E. Brit. art. Agr.)*

4770. *Brown, one of the best bean growers in Britain, gives the following directions. The furrow ought to be given early in winter, and as deep as possible, that the earth may be sufficiently loosened, and room afforded for the roots of the plant to search for the requisite nourishment. This first furrow is usually given across the field, which is the best method when only one spring furrow is intended; but as it is now ascertained, that two spring furrows are highly advantageous, perhaps the one in winter ought to be given in length, which lays the ground in a better situation for resisting the rains, and renders*

it sooner dry in spring, than can be the case when ploughed across. On the supposition, that three furrows are to be given, one in winter, and two in spring, the following is the most eligible preparation. The land being ploughed in length, as early in winter as is practicable, and the cross gutter and headland furrows sufficiently digged out, take the second furrow across the first as soon as the ground is dry enough in spring to undergo the operation; water-furrow it immediately, and dig again the cross gutter and headland furrows, otherwise the benefit of the second furrow may be lost. This being done, leave the field for some days, till it is sufficiently dry, when a cast of the harrows becomes necessary, so that the surface may be levelled. Then enter with the ploughs, and form the drills. (*Treatise on Rural Affairs.*)

4771. *Manure is frequently applied to the bean crop*, especially if it succeeds wheat. By some, dung is spread on the stubble previous to the winter ploughing, but this cannot always be done in a satisfactory manner, at least in the northern parts of the island, unless during frost, when it may lie long exposed to the weather before it can be turned down by the plough. The most desirable mode therefore is, to lay the manure into drills immediately before the beans are sown. (*Supp. &c.*)

4772. According to Brown, the best way is to *apply the dung* on the stubble before the winter furrow is given, which greatly facilitates the after process. Used in this way, a fore stock must be in hand; but where the farmer is not so well provided, spring dunging becomes necessary, though evidently of less advantage. At that season, it may either be put into the drills before the seed is sown, or spread upon the surface and ploughed down, according to the nature of the drilling process, which is meant to be adopted. Land dunged to beans, if duly hoed, is always in high order for carrying a crop of wheat in succession. Perhaps better wheat, both in respect of quantity and quality, may be cultivated in this way, than in any other mode of sowing.

4773. *The climate* most favorable to the bean is one neither very dry nor very moist, he first brings on the fly, and the last prevents the setting of the blossoms. In general, however, a dry summer is most favorable to the production of corn, and moist weather to the growth of the haulm.

4774. *The time of sowing* beans is as early as possible after the severity of winter is over; in the south, sometimes in January, but never later than the end of March; as the ripening of the crop and its safe harvesting would otherwise be very precarious in this climate. Bannister thinks, that the proper time for planting beans in Kent is towards the latter end of January, or early in the following month; though this business may be continued to advantage till the middle or latter end of March, if the weather had prevented their being got in at an earlier season: but in general it is best to embrace the first opportunity of sowing them after Candlemas, as they often miscarry if the season be procrastinated beyond that time, especially if a dry summer should succeed.

4775. *The mode of sowing* is almost always in rows. Though still sown broad-cast in several places, and sometimes dibbled, they are, for the most part, drilled by judicious cultivators, or deposited after the plough in every furrow, or only in every second or third furrow. In the latter method, the crop rises in rows, at regular intervals of nine, eighteen, or twenty-seven inches, and the hand-hoe ought invariably to be employed; but it is only where the widest interval is adopted, that the horse-hoe can be used with much effect in their subsequent culture.

4776. *There are two modes of drilling beans.* In one of these, the lands, or ridges, are divided by the plough into ridgelets, or one bout stitches, at intervals of about twenty-seven inches. If dung is to be applied, the seed ought to be first deposited, as it is found inconvenient to run the drill-machine afterwards. The dung may then be drawn out from the carts in small heaps, one row of heaps serving for three or five ridgelets; and it is evenly spread, and equally divided among them, in a way that will be more minutely described when treating of the culture of turnips. The ridgelets are next split out or reversed, either by means of the common plough, or one with two mould-boards, which covers both the seed and the manure in the most perfect manner. When beans are sown by the other method, in the bottom of a common furrow, the dung must be previously spread over the surface of the winter or spring ploughing. Three ploughs then start in succession, one immediately behind another, and a drill barrow either follows the third plough, or is attached to it, by which the beans are sown in every third-furrow, or at from twenty-four to twenty-seven inches asunder, according to the breadth of the furrow. *880a*

4777. *Another approved way of sowing beans*, when dung is applied at seed-time, is to spread the dung and to plough it down with a strong furrow; after this shallow furrows are drawn, into which the seed is deposited by the drill-machine. Whichever of these modes of sowing is followed, the whole field must be carefully laid dry by means of channels formed by the plough, and when necessary by the shovel; for neither then nor at any former period should water be allowed to stagnate on the land.

4778. *The dibbling of beans* is considered by Arthur Young as an excellent method, when well performed; but the grand objection to it is the difficulty of getting it well done. When it becomes the common husbandry of a district, the workmen find that great earnings are to be made by it; and this is much too apt to make them careless, and eager to earn still more; and if a very minute attention be not paid to them, by the constant attendance of the farmer, they strike the holes so shallow, that the first peck of a rook's bill takes the seed, and acres may be destroyed, if the breed of those birds be encouraged. Boys are employed for weeks together to keep the fields, but all weeks

that depend on boys are horribly neglected, and thus the farmer suffers materially; but if the seed is deposited two and a half, or (better) three inches deep, it is not so easily eradicated. In some districts, as Middlesex, Surrey, &c. the method is, to plant this pulse in rows stricken out by a line, by which a great saving is made in the article of seed, a circumstance which is thought to compensate for the extraordinary charge of this mode of husbandry; and thus far may be fairly acknowledged, that the method of planting beans by the dibber is greatly to be preferred to that of sowing the seed at random; the economy of this agricultural process is thus explained: the rows are marked out one foot asunder, and the seed planted in holes made two inches apart: the lines are stretched across the lands, which are formed about six feet over, so that when one row is planted, the sticks to which the line is fastened are moved by a regular measurement to the distance required, and the same method pursued till the field is completed. The usual price for this work is ninepence per peck, and the allowance two bushels per acre. Great confidence must necessarily be reposed in the people who transact the business of planting beans by the dibber, who, if inclined to fraud, have it in their power to deceive their employer by throwing great part of the seed into the hedge, from which their daily profits are considerably enhanced, their own labor spared, and every discovery effectually precluded, till the appearance of the crop, when the frequent chasms in the rows will give sufficient indications of the fraud; and by this time, perhaps, the villainous authors of the mischief may have escaped all possibility of detection, by having conveyed themselves from the scene of their iniquity.

4779. *The quantity of seed allowed is very different in the southern and northern parts of Britain; in the former, even when the rows are narrow, only two bushels or two bushels and a half; but in Scotland, seldom less than four bushels to the English statute acre, even when sown in ridgelets twenty-seven inches distant, and a bushel more when sown broad-cast.* We seldom have seen thin beans turn out well, unless the soil is particularly rich; nay, unless the rows close, weeds will get away after the cleaning process is finished, thereby disappointing the object of drilling, and rendering the system of little avail towards keeping the ground in good condition. Both in the broad-cast and drill husbandry, it is common to mix a small quantity of pease along with beans. This mixture improves both the quantity and quality of the straw for fodder, and the pease-straw is useful for binding up the sheaves in harvest.

4780. *The after culture of the bean crop commences with harrowing just before the young plants reach the surface.* When sown in rows, in either of the modes already mentioned, the harrows are employed about ten or twelve days after; and, being driven across the ridgelets, the land is laid completely level for the subsequent operations, and the annual weeds destroyed.

4781. *After the beans have made some growth, sooner or later, according as the soil may happen to be encumbered with or free from weeds, the horse-hoe is employed in the interval between the rows; and followed by the hand-hoe for the purpose of cutting down such weeds as the horse-hoe cannot reach; all the weeds, that grow among the beans beyond the reach of either hoe, should be pulled up with the hand.* The same operations are repeated as often as the condition of the land, in regard to cleanness, may require.

4782. *Before the introduction of the horse-hoe, which merely stirs the soil, and cuts up the weeds, a common small plough, drawn by one horse, was used in working between the rows, and is still necessary where root-weeds abound.* This plough goes one bout, or up and down in each interval, turning the earth from the beans, and forming a ridgelet in the middle; then hand-hoes are immediately employed; and after some time, a second hand-hoeing succeeds to destroy any fresh growth of weeds. The same plough, with an additional mould-board, finally splits open the intermediate ridgelet, and lays up the earth to the roots of the beans on each side. The benefit of laying up the earth in this manner, however, is alleged to be counterbalanced by the trouble which it occasions in harvest, when it is difficult to get the reapers to cut low enough, and may be properly dispensed with, unless the soil be very wet and level.

4783. *In moist warm seasons, this grain hardly ever ripens effectually; and it is exceedingly difficult to get the straw into a proper condition for the stack.* In such cases, it has been found of advantage to switch off the succulent tops with an old scythe blade set in a wooden handle, with which one man can easily top-dress two acres a day. This operation, it is said, will occasion the crop to be ready for reaping a fortnight earlier, and also, perhaps a week sooner ready for the stack-yard after being reaped.

4784. *Before reaping beans the grain ought to be tolerably well ripened, otherwise the quality is impaired, whilst a long time is required to put the straw in such a condition as to be preserved in the stack.* In an early harvest, or where the crop is not weighty, it is an easy matter to get beans sufficiently ripened; but, in a late harvest, and in every one where the crop takes on a second growth, it is scarcely practicable to get them thoroughly ripened for the sickle. Under these circumstances, it is unnecessary to let beans stand

uncut after the end of September, or the first of October; because any benefit that can be gained afterwards, is not to be compared with the disadvantages that accompany a late wheat seed-time. Beans are usually cut with the sickle, and tied in sheaves, either with straw ropes, or with ropes made from pease sown along with them. It is proper to let the sheaves lie untied several days, so that the winning process may be hastened, and, when tied, to set them up on end, in order that full benefit from the air may be obtained, and the grain kept off the ground. (*Brown.*)

4785. *Beans are sometimes mown*, and in a few instances, even pulled up by the roots. They should in every case be cut as near the ground as possible, for the sake of the straw, which is of considerable value as fodder, and because the best pods are often placed on the stems near the roots. They are then left for a few days to wither, and afterwards bound and set up in shocks to dry, but without any head sheaves. (*Supp. &c.*)

4786. *Beans are stacked* either in the round or oblong manner, and it is always proper, if the stack be large, to construct one or more funnels to allow a free circulation of air.

4787. *The threshing of beans* is nearly as easy as that of pease. Threshing them by a machine may be considered advantageous as breaking the coarser ends of the straw, and separating the earth from their root-ends, or roots, if they have been reaped by pulling.

4788. *The produce of beans*, when proper management is exercised, and where diseases have not occurred, is generally from twenty-five to thirty-five bushels per acre. Donaldson says, that a crop of beans, taking the island at large, may be supposed to vary from sixteen to forty bushels, but that a good average crop cannot be reckoned to exceed twenty. In Middlesex, Middleton tells us, that bean-crops vary from ten to eighty bushels per acre. They are rendered a very precarious crop by the ravages of myriads of small black insects of the same species. The lady-birds (*Coccinella*) are supposed to feed on them, as they are observed to be much among them. Foot says, the average produce is from three and a half to four quarters per acre. In Kent, A. Young thinks, they probably exceed four quarters; but in Suffolk, he should not estimate them at more than three; yet five or six are not uncommon.

4789. *The produce in haulm*, in moist seasons, is very bulky.

4790. *In the application of beans*, the grain in Scotland is sometimes made into meal, the finer for bread and the coarser for swine; but beans are for the most part applied to the purpose of feeding horses, hogs, and other domestic animals. In the county of Middlesex, all are given to horses, except what are preserved for seed, and such as are podded while green, and sent to the London markets. When pigs are fed with beans, it is observed that the meat becomes so hard as to make very ordinary pork, but good bacon. It is also supposed that the mealmen grind many horse-beans among wheat to be manufactured into bread.

4791. *The flour of beans is more nutritive than that of oats*, as appears in the fattening of hogs; whence, according to the respective prices of these two articles, Dr. Darwin suspects that pease and beans generally supply a cheaper provender for horses than oats, as well as for other domestic animals. But as the flour of pease and beans is more oily, he believes, than that of oats, it may in general be somewhat more difficult of digestion; hence, when a horse has taken a stomach-full of pease and beans alone, he may be less active for an hour or two, as his strength will be more employed in the digestion of them than when he has taken a stomach-full of oats. A German physician gave to two dogs, which had been kept a day fasting, a large quantity of flesh food; and then taking one of them into the fields, hunted him with great activity for three or four hours, and left the other by the fire. An emetic was then given to each of them, and the food of the sleeping dog was found perfectly digested, whilst that of the hunted one had undergone but little alteration. Hence it may, he says, be found advisable to mix bran of wheat with the pease and beans, a food of less nutriment but of easier digestion; or to let the horses eat before or after them the coarse tussocks of sour grass, which remain in moist pastures in the winter; or, lastly, to mix finely-cut straw with them. It is observed in the fifth volume of *The Bath Papers*, that it has been found by repeated experience, that beans are a much more hearty and profitable food for horses than oats. Being out of old oats the two last springs, the writer substituted horse-beans in their stead. In the room of a sack of oats with chaff, he ordered them a bushel of beans with chaff, to serve the same time. It very soon appeared the beans were superior to the oats, from the life, spirit, and sleekness of the horses.

4792. *Bean straw*, when mixed with pease, Brown considers as affording almost as much nourishment when properly harvested, as is gained from hay of ordinary quality; when it is well got the horses are fonder of it than of pease straw. It should either be given when newly threshed, or else stacked up and compressed by treading or coverings, as the air is found materially to affect both its flavor and nutritive quality.

4793. *The produce of beans in meal* is like that of pease, more in proportion to the grain than in any of the cereal grasses. A bushel of beans is supposed to yield fourteen

pounds more of flour than a bushel of oats, and a bushel of pease eighteen pounds more, or, according to some, twenty pounds. A thousand parts of bean flour were found, by Sir H. Davy, to yield 570 parts of nutritive matter, of which 426 were mucilage or starch, 103 gluten, and 41 extract, or matter rendered insoluble during the process.

4794. *The diseases of beans* are, the rust, the honey-dew, mildew, and black fly or aphides. These diseases are brought on by very dry weather; the fly almost always succeeds the honey-dew; both are most prevalent on the summits of the plants, and some have attempted to mitigate the evil by cutting them off. In general, however, these diseases are without remedy, either preventive or positive. In extreme cases they destroy both the leaves, stalks, and fruit; and when this is foreseen, the best thing the farmer can do is to mow them or plough them down, and prepare the land for wheat or otherwise, according to the rotation.

SECT. III. *The Tare.*—*Vicia sativa*, L. *Diadel.* Decan. L. and *Leguminosæ*, J. Vesce, Fr.; *Wicke*, Ger.; and *Loglio*, Ital.

4795. *The tare, vetch, or fuch* (*Vicia sativa*, fig. 564.), has been cultivated for its stem and leaves from time immemorial. It is considered as a native plant, and is found wild also in China and Japan. Ray, in 1686, informs us that the common tare or vetch, was then sown almost all over Europe; that it was chiefly used in England, mixed with pease and oats, to feed horses; but that it was sometimes sown separately for soiling cattle, and was reputed to cause milch cows to yield much milk. The tare, Brown observes, is of hardy growth, and, when sown upon rich land, will return a large supply of green fodder for the consumption of horses, or for fattening cattle.

4796. *The varieties of tares* are chiefly two, the winter and spring tare; both have local names, as gore vetch, rath ripe vetch, &c. Some consider them as distinct species, but this is doubtful. As the result of an experiment tried for two years at Bury, in Suffolk, Professor Martyn observes, that there appears a material difference in the constitution, if we may so call it, of the two tares in question. Not to say any thing of a trifling difference in the color and size of their seeds, the only visible marks of distinction seems to be a disparity in the first leaves of the upright stalks, which, in the spring tare, are elliptic and rounded or notched at the end; but in the winter tare, linear and drawn to a point. The leaves on the branches which afterwards issue below, and in time form the bulk of the plants, are the same in both vetches. But whatever the difference may be, it is evident that the seeds of the two sorts ought to be kept separate, since each sown out of its proper season is found not to prosper.



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4797. *New varieties of tare* may be obtained by the usual means; and it is thought that some of the numerous species of this plant, which are natives of Europe, might be cultivated with advantage. The *vicia narbonnensis* and *seratifolia* are cultivated in Germany. Dr. Anderson has recommended the *V. sepium*; and a writer in *The Bath Agricultural Transactions*, the *V. cracca*. Some species of *lathyrus*, *orobus*, and *ervum*, might probably also be tried with success.

4798. *In choosing between the spring and winter tare*, every thing must depend on the intention of the crop. If the object is to have early feed, the winter variety is undoubtedly to be preferred; but where the land is foul and requires to be two or three times ploughed in spring, or where a late crop is desired, or a crop for seed, then the spring variety will generally deserve the preference.

4799. *The soil preferred by the tare* is a clay, but they will grow in any rich soil not over dry. In a moist climate, the haulm grows so luxuriant as to rot at bottom; and in one over dry it is deficient in length. A dry season, however, is on the whole more favorable than a moist one, as this crop soon covers the surface.

4800. *The preparation of the soil* seldom consists of more than one ploughing, if for autumn sowing; and of a winter and spring ploughing, when to be sown in spring. If in the latter case, the land is very foul, several ploughings are given, or one ploughing and several stirrings with the cultivator. In general, tares succeed some of the corn crops. In England manure is sometimes given either with a view to eating them off early, and following with a crop of turnips, or to the enriching the soil for a crop of wheat.

4801. *The time of sowing* depends on the kind of tare, and the purpose in view. The winter variety is sown in September and October; and the first sowing in spring ought to be as early as the season will permit. If they are to be cut green for soiling through-

out the summer and autumn, which is the most advantageous method of consuming them, successive sowings should follow till the end of May. Summer tares, when meant for seed, Brown observes, ought to be sown early, "otherwise the return will be imperfect; but when for green food, any time betwixt the first of April and the latter end of May will answer well, provided crops in succession, from the first to the last mentioned period, be regularly cultivated. Instances are not wanting of a full crop being obtained even when the seed was sown so late as the middle of June, though sowing so late is a practice not to be recommended. In Middlesex, the winter-sowings are commenced about the beginning of August: in the northern counties no winter-sowings are made, as the tare there will not endure the severity of the season.

4802. *The mode of sowing tares* is mostly broad-cast, which should be performed as evenly as possible over the surface of well-prepared land; the seeds being afterwards covered in by proper harrowing, in order to prevent their being picked up by birds, and ensure their perfect vegetation and growth. It has been suggested, however, that in rich clean soil, it is probable the row-method would succeed well with this sort of crop, as Marshal states, is the practice in some of the southern districts of the island. After the seed is sown, and the land carefully harrowed, a light roller ought to be drawn across, so that the surface may be smoothed, and the scythe permitted to work without interruption. It is proper also to guard the field for several days against the depredations of pigeons, who are remarkably fond of tares, and will pick up a great part of the seed, unless constantly watched.

4803. *The quantity of seed* to an acre is from two and a half to three and a half bushels, according to the time of sowing, and as they are to be consumed green or left to stand for a crop. When tares are intended for seed, less seed is required than when they are grown for soiling or for drying the haulm. A writer in *The Farmer's Magazine* (vol. i.) has suggested that the most productive method of sowing this crop, when intended for seed, is to mix them amongst beans when drilled, at the rate of one firlo of tares to one boll of beans. From trials made, it is ascertained, it is said, that the quality of the tares is vastly improved by being blended with beans, as, by clinging to the latter, they are kept from the ground, and enjoy the full benefit of the sun, for ripening them in a perfect manner; and they are in this way much easier harvested than when sown by themselves. They answer, at the same time, for bands to tie the principal crop; and the produce may, on an average of seasons, be considered as at least double. A little rye sown with winter tares, and a few oats with the spring sort, not only serve to support the weak creeping stems of the tares, but add to the bulk of the crop by growing up through the interstices.

4804. In the *choice of the seed* it is hardly possible to distinguish the grain of the winter from that of the spring variety: the former is alleged to be rather smaller and lighter colored; but the only reliance must be on the honesty of the vendor. Plump seed and a sample free from the seeds of weeds, will of course be selected, whatever be the variety.

4805. *The after culture* given to tares consists merely in pulling out the larger weeds, unless they are in rows, in which case the horse or hand-hoe is applied; or intended for seed, in which case weeding must be more particularly executed.

4806. In *reaping tares for soiling* they ought always to be cut with the scythe, as, the sickle by breaking asunder the stalks, and tearing up a number by the roots, renders the second crop of little value. When mown early, they will in a moist season produce three mowings, but generally two. In reaping tares for seed, they may be either mown or taken with the sickle, and treated like pease in drying, stacking, and threshing.

4807. Tares are *eaten off the ground* in some places by different kinds of live-stock, particularly by sheep; and as the winter-sown variety comes very early in spring, the value of this rich food is then very considerable. The waste, however, in this way, even though the sheep be confined in hurdles, must be great; and still greater when consumed by horses or cattle.

4808. *Tare crops are sometimes made into hay*, in which case more attention is found necessary than in those of most of the artificial grasses, as wet is more injurious to them, and they require more sun and air; but in other respects they demand the same cautious management, in order to preserve the foliage from being lost. The time for cutting for this purpose is, according to the author of *The Synopsis of Husbandry*, when the blossoms have declined and they begin to fall and lie flat. When well made, the hay is of the best and most nutritious quality or properties.

4809. *The produce of tares cut green* is, according to Middleton, ten or twelve tons per acre, which is a large crop; and when made into hay at about three tons the acre, which shows the disadvantage of making these crops into hay. And it is found, that the spring tare crops are lighter, and most liable to be injured by a dry season.

4810. *The produce in seed* is likewise found to be considerable, being by some stated at from three to six sacks; but in other instances forty bushels, or more, have been obtained from the acre.

4811. In the *application of tares* they are found to be a hearty and most nourishing food

for all sorts of cattle. Cows give more butter when fed with this plant than with any other food whatsoever. Horses thrive better upon tares than they do upon clover and ryegrass; and the same remark is applicable to fattening of cattle, who feed faster upon this article of green fodder, than upon any kind of grass or esculent with which we are acquainted. Danger often arises from their eating too many, especially when podded; as colics, and other stomach disorders, are apt to be produced by the excessive loads which they devour. Perhaps a great quantity of fixed air is contained in this vegetable; and as heavy crops are rarely dry at the root when cut, it is not to be wondered that accidents often happen, when the animal is indulged with the unrestrained consumption of them. Were oat straw mixed with the tares in the racks or stalls in which they are deposited, it is probable that fewer accidents would follow, though this assistant is only required when the tares are wet, foul, or over succulent. If the plants be cut green, and given to live-stock, either on the field, or in the fold-yards, there is, perhaps, no green crop of greater value, nor any better calculated to give a succession of herbage from May to November. The winter-sown tare, in a favorable climate, is ready for cutting before clover. The first spring crop comes in after the clover must be all consumed or made into hay; and the successive spring sowings give a produce more nourishing for the larger animals than the aftermath of clover, and may afford green food at least a month longer. In the county of Sussex, Young observes, "tare crops are of such use and importance that not one-tenth of the stock could be maintained without them; horses, cows, sheep, hogs, all feed upon them; hogs are soiled upon them without any other food. This plant maintains more stock than any other plant whatsoever. Upon one acre, Davis maintained four horses in much better condition than upon five acres of grass. Upon eight acres he has kept twelve horses and five cows for three months without any other food: no artificial food whatever is equal to this excellent plant." This statement must be coupled with the usual produce of turnips in Sussex, 10 or 15 tons per acre: hence the supposed superiority of tares to every other green crop. Tares cut green, Professor Thier observes, draw no nourishment from the soil whatever, while made into hay, they afford a fodder preferred by cattle to pease-straw, and more nutritive than hay or any other herbage.

4812. *The use of the grain of tares* is generally for reproduction; but they are also given to pigeons, by whom they are highly relished, and it is thought they would form a very good food for poultry. In Germany they are given to horses, cows, sheep, and swine.

4813. *The diseases of tares* are so few as to be of no consequence. A crop is sometimes, but rarely, lost by mildew.

SECT. IV. *Of other Leguminous Grains, which might be cultivated in British Farming.*

4814. *The lentil, kidneybean, and chick pea* are grown both in France and Germany as field plants for their grains, to be used as food. They are by no means likely to become articles of general culture in Britain; but it is worth while to know that they may be cultivated here instead of being imported, and also that they form very excellent articles of human food.

4815. *The lentil is the Ervum lens, L. Les lentilles, Fr.; Lentizen, Ger.; and Lenticcia, Ital. (fig. 565.)* It is a legume of the greatest antiquity, being in esteem in Esau's time, and much prized in eastern countries ever since. In Egypt and Syria, they are parched in a frying-pan and sold in the shops, and considered by the natives as the best food for those who undertake long journeys. The lentil is considered a native of France, but has been known in England from the earliest agricultural records. In Gerard's time, they were sown like tares, their haulm given to cattle, and the grain to pigeons, and used in meagre soups.

4816. *There are three varieties of lentils* cultivated in France and Germany; the small brown, which is the lightest flavored, and the best for haricots and soups; the yellowish, which is a little larger, and the next best; and the lentil of Provence, which is almost as large as a pea with luxuriant straw, and more fit to be cultivated as a tare, than for the grains as human food.

4817. *A dry warm sandy soil* is requisite for the lentil; it is sown rather later than the pea, at the rate of a bushel or one and a half bushels to the acre; in other respects its culture and harvesting are the same, and it ripens sooner. The lentil, Young observes, is a crop not uncommon about Chesterford in Essex, where they sow a bushel an acre on one ploughing in the beginning or middle of March. It is there the custom to make hay of them, or seed them, for cutting into chaff for wrough-meal for sheep and horses, and they sow them on both heavy and dry soils. It is, however, added, that the whole country is of a calcareous nature. It is likewise stated, that attention should



be paid not to water horses soon after eating this sort of food, as they are apt to hove them. They are likewise asserted to be cultivated for the same purpose in Oxfordshire, and probably in other districts.

4818. *The produce of the lentil* in grain is about a fourth less than that of the tare ; and in straw it is not a third as much, the plants seldom growing above one and a half feet high. The straw is, however, very delicate and nourishing, and preferred for lambs and calves, and the grain on the continent sells at nearly double the price of pease. Einhoff obtained from 3840 parts of lentils, 1260 parts of starch, and 1433 of a matter analogous to animal matter.

4819. *The use of the lentil* on the continent is very general, both in soups and dressed with a butter sauce as haricot. They are imported from Hamburgh, and sold in London for the same purpose.

4820. *The chick pea* (*Cicer arietinum*, fig. 55.), grows naturally in the south of Europe, and is cultivated there for the same purposes as the lentil, but it is too delicate for field culture in this country.

4821. *The kidneybean* (*Phaseolus vulgaris*, L. *Haricot*, Fr. ; *Schminkbohne*, Ger. ; and *Fagiolo*, Ital.) is a native of India, but ripens readily in dry summers in most parts of Britain. Its culture has been hitherto confined to gardens, but it might be grown equally well in dry, warm, rich, and sheltered soils, being grown in the fields of Germany, Switzerland, and similar climates. The sort generally used for this purpose is the small dwarf white ; the ground is prepared by several stirrings, and the seed is dibbled in rows eighteen inches or two feet asunder in the beginning of May. The ground is hoed and weeded during the summer, and the crop is ripe in August. It is usually harvested by pulling up the plants, which, being dried, are stacked or threshed. The haulm is of little bulk or use, but the grain is used in making the esteemed French dish called haricot, which it were desirable the cottagers of this country were made acquainted with. There is perhaps no other vegetable dish so cheap and easily cooked, and at the same time so agreeable and nourishing. The beans are boiled and then mixed with a little salt butter or other fat, and a little milk or water, and flour. From 3840 parts of kidneybean, Einhoff obtained 1805 parts of matter analogous to starch, 851 of vegeto-animal matter, and 799 parts of mucilage. Haricots and lentils are much used in all Catholic countries during Lent and *maigre* days, as they, from their peculiar constituents, form so excellent a substitute for animal food. During the prevalence of the Roman religion in this country, they were probably much more generally used than at present ; as reformations are often carried farther than is necessary, possibly lentils may have been left off by Protestants, lest the use of them may have been considered a symptom of popery.

4822. *The lupin* (*Lupinus luteus*, L. fig. 566.), was cultivated by the Romans as a legume, and is still occasionally grown in Italy. The grain was formerly, and is occasionally now used as food ; but more generally the whole plant is mown and given as herbage to cattle, and sometimes the crop is ploughed down as manure.



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CHAP. IV.

Of Plants cultivated for their Roots or Leaves.

4823. *Plants cultivated for their roots or leaves* are various, and most of them are adapted both for human food and that of domestic animals ; but some are chiefly or entirely grown for the nurture of live-stock. The plants which we include under this head, are the potatoe, turnip, carrot, parsnep, beet, cabbage tribe, lettuce, and chiccory. The culture of roots may be considered a branch of farming almost entirely of modern origin, and more peculiarly British than any other department. Turnips were cultivated by the Romans, and in modern times brought into notice as objects of field culture in the last century, but they were most imperfectly managed, and of very little utility in agriculture till their culture was undertaken by the British farmer. The potatoe, carrot, and parsnep, were also first cultivated in the fields of this country. Freable or light soil, superior pulverisation, and manuring, the row-method, and careful after-culture, are essential to the maturation of the plants to be treated of in this Chapter ; and hence the importance of such crops as preparations for those of the bread corns.

4824. *The nutritive products of these plants are thus given by Sir H. Davy :*

Systematic name.	The quantity analysed, of each sort 1000 parts.	Whole quantity of soluble or nutritive matter.	Mucilage or starch.	Saccharine matter or sugar.	Gluten or albumen.	Extract, or matter rendered insoluble during evaporation.
<i>Solanum tuberosum</i>	Potatoe	From 250 to 200.	From 200 to 155.	From 20 to 15.	From 40 to 30.	
<i>Beta vulgaris</i>	Red beet	148	14	121	13	
<i>Brassica rapa</i>	Common turnip	42	7	34	1	
var. <i>ruta baga</i>	Swedish turnip	64	9	51	2	2
<i>Daucus carota</i>	Carrot	98	3	95		
	Parsnep	99	9	90		
<i>Beta cicla</i>	White beet	136	13	119	4	
<i>Brassica oleracea</i>	Cabbage	73	41	24	8	

SECT. I. *The Potatoe.* — *Solanum tuberosum*, L. *Pentan. Monog. L.* and *Solanæ*, J. *Pomme de Terre*, Fr. ; *Cartoffel*, Ger. ; *Turtufflo* or *Pomo di Terra*, Ital.

4825. *The potatoe* is supposed to be a native of South America ; but Humboldt is very doubtful if that can be proved ; he admits, however, that it is naturalised there in some situations. Sir J. Banks (*Hort. Trans.* vol. i. p. 8.) considers that the potatoe was first brought into Europe from the mountainous parts of South America, in the neighborhood of Quito, where they were called *papas*, to Spain, in the early part of the sixteenth century. From Spain, where they were called *battatas*, they appear to have found their way first to Italy, where they received the same name with the truffle, *taratouffi*. The potatoe was received by Clusius, at Vienna, in 1598, from the governor of Mons, in Hainault, who had procured it the year before from one of the attendants of the Pope's legate, under the name of *taratoufflo*, and learned from him that it was then in use in Italy. In Germany it received the name of *cartoffel*, and spread rapidly even in Clusius's time.

4826. *To England the potatoe was brought from Virginia by the colonists sent out by Sir Walter Raleigh in 1584, and which returned in July 1586, and "probably," according to Sir Joseph Banks, "brought with them the potatoe."* Thomas Herriot, in a report on the country, published in De Bry's *Collection of Voyages*, (vol. i. p. 17.) describes a plant called *openawk*, with "roots as large as a walnut, and others much larger ; they grow in damp soil, many hanging together, as if fixed on ropes ; they are good food, either boiled or roasted." Gerarde, in his *Herbal*, published in 1597, gives a figure of the potatoe, under the name of the *potatoe of Virginia*, whence, he says, he received the roots ; and this appellation it appears to have retained, in order to distinguish it from the *battatas*, or sweet potatoe (*Convolvulus battatas*), till the year 1640, if not longer. "The sweet potatoe," Sir Joseph Banks observes, "was used in England as a delicacy long before the introduction of our potatoes : it was imported in considerable quantities from Spain and the Canaries, and was supposed to possess the power of restoring decayed vigor. The kissing comfits of Falstaff, and other confections of similar imaginary qualities, with which our ancestors were duped, were principally made of these and of eringo roots."

4827. *The potatoe was first planted by Sir William Raleigh on his estate of Youghall, near Cork, and Gough says, was "cherished and cultivated for food" in that country before its value was known in England ; for, though they were soon carried over from Ireland into Lancashire, Gerarde, who had this plant in his garden in 1597, under the name of Battata Virginiana, recommends the roots to be eaten as a delicate dish, not as common food. Parkinson mentions, that the tubers were sometimes roasted, and steeped in sack and sugar, or baked with marrow and spices, and even preserved and candied by the comfit-makers.*

4828. *For encouraging the cultivation of potatoes, with the view of preventing famine, the Royal Society took some measures in 1633. Still, however, although their utility as an article of food was better known, no high character was bestowed on them. In books of gardening, published towards the end of the seventeenth century, a hundred years after their introduction, they are spoken of rather slightly. "They are much used in Ireland and America as bread," says one author, "and may be propagated with advantage to poor people." "I do not hear that it hath been yet essayed," are the words of another, "whether they may not be propagated in great quantities, for food for swine or other cattle." Even the enlightened Evelyn seems to have entertained a prejudice against them : "Plant potatoes," he says, writing in 1699, "in your worst ground. Take them up in November for winter spending ; there will enough remain for a stock, though ever so exactly gathered." But the use of potatoes gradually spread, as their excellent qualities became better understood. It was near the middle of the eighteenth century, however, before they were generally known over the country : since that time they have been most extensively cultivated. In 1796, it was found, that in the county of Essex alone, about 1700 acres were planted with potatoes for the supply*

of the London market. This must form, no doubt, the principal supply; but many fields of potatoes are to be seen in the other counties bordering on the capital, and many ship-loads are annually imported from a distance. In every county in England, it is now more or less an object of field culture.

4829. *Potatoes, as an article of human food*, are, next to wheat, of the greatest importance in the eye of the political economist. From no other crop that can be cultivated will the public derive so much food as from this valuable esculent; and it admits of demonstration, that an acre of potatoes will feed double the number of people that can be fed from an acre of wheat. Potatoes are also a nourishing and healthy food, relished by almost every palate; and it is believed there is hardly a dinner served up for six months in the year without them, in any part of the kingdom. Notwithstanding all these things, and they are of great importance in one point of view, we are doubtful whether potatoes can be placed so high in the scale as several other articles of produce, when the profit and loss account of the agriculturist is to be ascertained. They require a great deal of manure from the farmer; while, generally speaking, little is returned by them; they are a bulky unhandy article, troublesome in the lifting and carrying processes, and interfering with the seed season of wheat, the most important one to the farmer. After all, from particular circumstances, they cannot be vended unless when raised in the vicinity of large towns; hence they are in most respects an unprofitable article to the agriculturist. To him the real criterion is the profit which potatoes will return in feeding beasts; and here we apprehend, the result will altogether be in favor of turnips, and ruta бага, as the most profitable articles for that purpose.

4830. *What is called the yam, or Surinam potatoe*, is of more importance to the farmer, because with this variety he has an excellent assistant to his turnip crop, or rather a succedaneum, which is of material benefit when turnips are consumed. Perhaps this root may be cultivated with greater advantage than ruta бага upon many soils, as the precariousness of ruta бага has been acknowledged by almost every one who has treated upon the subject. It requires soil of the best quality, and a large dose of rich dung, to insure even a middling crop of ruta бага; therefore it can never be generally nor profitably cultivated by common farmers. On the other hand, yams present every advantage which can be got from ruta бага, and are not so pettish in their growth. Their culture is a matter of far less difficulty, as they will grow upon soils where ruta бага would starve. They require less manure, and may be planted as late in the season as the other, thereby enabling the farmer to bestow the like previous preparation upon the ground, the want of which is a general argument against ordinary potatoe husbandry. By taking them up in October or November, they may be safely housed, and the ground directly ridged up and sown with wheat. (*Brown.*)

4831. *The value of potatoes as a fallow crop*, and as an article of food for cattle compared with turnips and cabbages for the same purposes, Marshal observes, may be considered thus: Potatoes are more nutritious; and, in the opinion of those who have used them, fatten cattle much quicker than either turnips or cabbages. Potatoes, too, being secured from the severities of winter, are a more certain article of fattening than turnips or cabbages; both of which are liable to perish under an alternancy of frost and thaw; and the turnip, more particularly, is locked up, or rendered more difficult to be come at, during a continuance of snow or frost. Turnips and cabbages, if they out-weather the severities of winter, occupy the soil in the spring when it is wanted to be prepared for the succeeding crop; while potatoes, if properly laid up, are a food which may be continued without inconveniency until the cattle be finished, or the grass has acquired the requisite bite for finishing them in the field. On the other hand, potatoes are a disagreeable crop to cultivate: the planting is a tedious dirty business; and taking them up, may be called the filthiest work of husbandry, especially in a wet autumn. A powerful argument for the extensive culture of potatoes as food for live-stock is, that in seasons of scarcity they can be adopted as human food. Here, as in many other points, the opinion of Marshal and other English agriculturists, is rather at variance with that of the Northumberland and Berwickshire cultivators.

4832. *The varieties of the potatoe* are innumerable: they differ in their leaves and bulk of haulm; in the color of the skin of the tubers; in the color of the interior compared with that of the skin; in the time of ripening; in being farinaceous, glutinous, or watery; in tasting agreeably or disagreeably; in cooking readily or tediously; in the length of the subterraneous stolones to which the tubers are attached; in blossoming or not blossoming; and, finally, in the soil which they prefer.

4833. *The earliest varieties of the potatoe* are chiefly cultivated in gardens, and therefore we shall only notice such early sorts as are grown in the fields. These are —

The early kidney,
The nonsuch,

The early shaw, and
The early champion.

The last is the most generally cultivated round London; it is very prolific, hardy, and early. Early varieties, with local names, are cultivated near most large towns, especially Lancaster, Liverpool, Glasgow, Edinburgh, and the metropolis.

4834. *The late field varieties* in most repute are —

The red-nose kidney.

Large kidney.

Bread fruit, raised in 1810, from seed, and esteemed one of the best field potatoes; being white, mealy, well tasted, and prolific.

Lancashire pink eye, good.

Black skin, white interior, and good.

Purple, very mealy, productive, and keeps well.

Red apple, mealy, keeps the longest of any.

Tartan, or purple and white skinned, an esteemed Scotch potato, prolific, mealy, exceedingly well tasted, and keeps well.

4835. *The varieties grown exclusively as food for live-stock* are —

The yam or Surinam potatoe; large, red and white skinned, and the interior veined with red; flavor disagreeable, and not such as to admit of its being used as human food. It succeeds best on heavy lands.

The ox noble; large, yellow without and within, very prolific, not fit to eat.

The late champion; large and prolific, white skinned, and may be used as human food.

4836. *New varieties of potatoes* are procured with the greatest ease. The following directions are given in a useful work on this plant. Pluck off the apples when the stalk has ceased to vegetate and is drying up. The seed being then fully ripe, break the apple in a hair sieve, wash the pulp clean from the seeds, and dry them in the sun; then sow the seed in beds in March, and take the potatoes up in October. They will attain the size of nutmegs, or at most be no larger than walnuts. Select the fairest and best, and keep them secure from frost by thoroughly drying, and intermixing, and covering them with sifted wood or coal-ashes. Plant them in April following, at the distance of fifteen inches asunder; and when the plant is two inches high, hill them with fresh earth. This may be done several times, constantly taking care to keep them clean from weeds. Observe when the stalks decay; some will be found decaying much sooner than others; these are the early kind, but those that decay last are the sort which comes late. Take them up in rotation as they ripen, and let the produce of each potatoe be kept separate till the next year. Such as come early, may be tried as soon as they are taken up, by dressing one or two; should they be approved, the remainder may be preserved; but those which are late should not be tried before January or February, for it will be found that the late kind of potatoes, newly raised, are very soft, and cut like soap, until they have been hoarded a certain time, when they become mealy. Under each stalk you may expect to find a gallon of potatoes. Those planted the third year may, perhaps, produce two sacks; and their increase afterwards will be very considerably greater. Thus it takes full three years to form an adequate judgment of potatoes raised from seed, and, after all, if one in ten succeed so as to be worth preserving, it is as much as can be reasonably expected.

4837. *Some of the earlier sorts of potatoes do not blossom*, and consequently do not, under ordinary management, produce seeds. To procure blossoms and seeds from these, it is necessary, from time to time, during the early part of the summer, to remove the earth from the roots of the plants, and pick off the tubers, or potatoes as they begin to form. By thus preventing the strength of the plant from being employed in forming tubers at the root, it will flow into the leaves and herbage, and produces blossoms and apples. Knight, the president of the Horticultural Society, by adopting this practice, succeeded in procuring seeds from some sorts of potatoes, which had never before produced blossoms; and from these seeds he raised excellent varieties, some hardy and less early, others small and very early. He farther impregnated the blossoms produced by these early potatoes with other sorts, some early and some late (in the way in which graziers cross the breeds of cattle to improve the offspring), and he succeeded in producing varieties, more early than late sorts, and more hardy and prolific than any early potatoes he had seen. These he cultivated in his fields, deeming them preferable to all other sorts as admitting of later planting and earlier removal, and this practice he justly considered as highly favorable to the succeeding crop of wheat.

4838. *In choosing a sort or sorts of potatoes* from the numerous varieties which are to be found every where, perhaps the best way is, for the selector to procure samples and taste them, and to fix on what best pleases his palate. The shaw is one of the best early potatoes for general field culture; and the kidney and bread-fruit are good sorts to come in in succession. The Lancashire pink is also an excellent potatoe, and we have never in any part of the British isles tasted a potatoe equal in mealiness and flavor to this variety, as cultivated round Prescot, near Liverpool. The red apple and tartan are of undoubted preference as late or long keeping potatoes. The yam is decidedly the best potatoe for stock, and will produce from twelve to fifteen tons per acre.

4839. *The soil in which the potatoe thrives best* is a light loam, neither too dry nor too moist, but if rich, it is so much the better. They may, however, be grown well on many other sorts of lands, especially those of the mossy, moory, and other similar kinds, where they are free from stagnant moisture, and have had their parts well broken down by culture, and a reasonable portion of manure added. The best flavored table potatoes are almost always produced from a newly broken up pasture ground not manured; or from any new soil, as the site of a grubbed up copse or hedge, or the site of old buildings or roads. Repeated on the same soil they very generally lose their flavor. The yam produces the largest crops on a loamy and rather strong soil, though it will grow well on any that is deep ploughed and well manured.

4840. *In preparing the soil for potatoes*, it is of much importance to free it as completely as possible from weed roots, which cannot be so well extirpated afterwards, as in the culture of turnips, and some other drilled crops, both because the horse-hoe must be excluded altogether at a time when vegetation is still vigorous, and because at no period of their growth is it safe to work so near the plants, especially after they have made some progress in growth. It is the earlier time of planting, and of finishing the after-culture, that renders potatoes a very indifferent substitute for fallow, and in this respect in no degree comparable to turnips. For this reason, as well as on account of the great quantity of manure required, their small value at a distance from large towns, and the great expense of transporting so bulky a commodity, the culture of potatoes is by no means extensive in the best managed districts. Unless in the immediate vicinity of such towns, or in very populous manufacturing counties, potatoes do not constitute a regular rotation crop, though they are raised almost every where to the extent required for the consumption of the farmer and his servants, and, in some cases, for occasionally feeding horses and cattle, particularly late in spring. The first ploughing is given soon after harvest, and a second, and commonly a third, early in spring; the land is then laid up into ridgelets, from twenty-seven to thirty inches broad, as for turnips, and manured in the same manner.

4841. *The best manure for the potatoe* appears to be littery farm-yard dung; and the best mode of applying it immediately under the potatoe sets. Any manure, however, may be applied, and no plant will bear a larger dose of it, or thrive in coarser or less prepared manure: even dry straw, rushes, or spray of trees, may be made use of with success. It is alleged, however, that recent horse manure, salt, and soapers ashes, have a tendency to give potatoes a rank taste, and to render them scabby.

4842. *The best climate for the potatoe* is one rather moist than dry, and temperate or cool, rather than hot. Hence the excellence of the Irish potatoes, which grow in a dry loamy calcareous soil and moist and temperate climate: and hence, also, the inferiority of the potatoes of France, Spain, and Italy, and even Germany. In short, the potatoe is grown no where in the world to the same degree of perfection as in Ireland and Lancashire, and not even in the south of England so well as in Scotland, and the north and western counties: all which is, in our opinion, clearly attributable to the climate.

4843. *The season for planting early potatoes in the fields*, depends much on the soil. Where this is very dry, as it always ought to be for an early crop, the sets may be put in the ground in March or earlier; but for a full crop of potatoes, April is the best time for planting. Potatoes, indeed, are often planted in the end of May, and sometimes even in June; but the crops, although often as abundant, are neither so mellow nor mature, as when the sets are planted in April, or in the first eight or ten days of May.

4844. *In preparing the sets of potatoes*, some cultivators recommend large sets, others small potatoes entire, and some large potatoes entire. Others, on the ground of experience, are equally strenuous in support of small cuttings, sprouts, shoots, or even only the eyes or buds. With all these different sorts of sets, good crops are stated to have been raised, though tolerable sized cuttings of pretty large potatoes, with two or three good eyes or buds in each, are probably to be preferred. Independent of the increased expense of the seed, it is never a good practice to make use of whole potatoes as sets. The best cultivators in Ireland and Scotland invariably cut the largest and best potatoes into sets, rejecting in the case of kidney potatoes the root or mealy end as having no bud, and the top or watery end as having too many. No objection is made to two or even three buds on each set, though one is considered as sufficient. A very slight exercise of common sense might have saved the advocates for shoots, scooped out eyes, &c. their experiments and arguments, it being evident, as Brown has observed, to every one that has any practical knowledge of the nature of vegetables, that the strength of the stem at the outset depends in direct proportion upon the vigor and power of the set. The set, therefore, ought to be large, rarely smaller than the fourth part of the potatoe; and if the set is of small size, one half of the potatoe may be profitably used. At all events, rather err in giving over large sets, than in making them too small; because by the first error, no great loss can be sustained; whereas, by the other, a feeble and late crop may be the consequence.

4845. *The time for cutting the sets* should always be some days before planting, that the wounds may dry up; but no harm will result from performing this operation several weeks or months beforehand, provided the sets are not exposed too much to the drought so as to deprive them of their natural moisture.

4846. *The quantity of sets* depends on the size of the potatoes; in general where the sets are sufficiently large from eight to ten cwt. will be required for an acre: more than ten for yams, and fewer than eight cwt. for the early nonsuch and ash-leaved.

4847. *The modes of planting the potatoe* are various. Where spade culture is employed, they are very frequently planted on beds (provincially lazy-beds), of four or six

feet wide, with a trench or gutter between a foot or eighteen inches in width, and which supplies soil for earthing up the potatoes. This is the rudest mode of planting and cultivating potatoes, and unworthy of being imitated either on a farm or garden. The next mode is planting on a plain surface, either with or without manure, according to the state of the soil. Here the sets are placed in rows at from eighteen inches to two and a half feet distance between the rows, according to the kind of potatoe, and from four to nine inches distant in the rows. In planting, a hole for each set is made by a man with a spade, while a woman or boy drops the set, and the earth is replaced; or the potatoe dibber is used, and the ground afterwards slightly harrowed. Another mode of planting on a plain surface, when the soil is inclined to be dry, is in some cases practised, which is, after the land has been brought into a proper condition by ploughing over twice or oftener and well harrowed, to spread the manure regularly over the whole surface, the sets being planted in every third furrow, and the dung with the fine earth turned upon them by the next furrow of the plough. In this way the manure is however placed upon the sets, which has on experiment been fully shown to be injurious to the produce. Besides, from the whole of the surface of the ground being covered with dung, a considerably larger proportion must be requisite than when deposited only in the drills, and of course the crop cannot be cultivated to advantage in that respect.

4848. *In planting the potatoe on sward land*, after it has been prepared by the use of a plough that just pares off the surface and deposits it in the furrow, it is advised by Somerville to place the sets upon the inverted sod, and cover them with the loose mould from below by means of a common plough; or the trench plough may be used with perhaps more advantage: but a better method is that of paring and burning. In some cases the practice is, however, to turn down the turf with or without manure, and then to put in the sets by a dibble; though the former is probably the better practice, as the turfy material on which the sets are put soon begins to decay, and the purpose of a manure is in some measure answered by it. It is a plan that may be adopted with advantage where manure is scarce, as in bringing waste and other coarse grass lands into the state of preparation for grain crops.

4849. *A mode of planting potatoes and at the same time trenching the land*, is practised in Lancashire, and in some districts in the north-east of Scotland. The farmer having carried the dung, and laid it on the field in heaps, at proper distances, the operation is performed by the manufacturers and people who rent the field, and in the following manner: Across the end of the ridge, a trench is formed, about three feet wide, and from ten to fourteen inches deep, according to the depth and quality of the subsoil. That being done, a second trench of the same breadth is marked off, and the surface-soil, to the depth of six or eight inches, is thrown into the bottom of the former trench, over which a sufficient quantity of dung being laid, the potatoes are planted at the distance of eight or ten inches from each other, and then as much earth is taken from the bottom of the second trench, as is necessary for covering the potatoe sets, and of making up the first trench to its former level. Thus the field being completely trenched, well manured, and kept thoroughly clean by repeated hand-hoeings, must not only produce an abundant crop of potatoes, but also be in high condition for receiving whatever kind of seed may be afterwards sown.

4850. *The mode of planting potatoes by the best farmers of the northern districts*, is in drills formed by the plough in the same manner as in preparing the land for turnips. The soil is laid up into ridgelets from twenty-seven to thirty inches broad, the manure is distributed between them, and on this manure the sets are placed from four to eight inches asunder: they are then covered by reversing the ridgelets.

4851. *The planting of early potatoes* is carried to a very high degree of perfection in Lancashire. It is stated in *The Lancashire Agricultural Report*, in respect to the raising of seed potatoes, that upon the same ground from which a crop has already been taken, the early seed potatoes are in some places afterwards planted; which, after being got up about November, are immediately cut up into sets, and preserved in oat husks or saw-dust, where they remain till March, when they are planted, after having had one spit taken off, and planted with another, of a length sufficient to appear above ground in the space of a week. But the most approved method is, to cut the sets, and put them on a room-floor, where a strong current of air can be introduced at pleasure, the sets laid thinner, as about two layers in depth, and covered with the like materials (chaff or saw-dust) about two inches thick: this screens them from the winter frosts, and keeps them moderately warm, causing them to vegetate; but at the same time admits air to strengthen them, and harden their shoots, which the cultivators improve by opening the doors and windows on every opportunity afforded by mild soft weather: they frequently examine them, and when the shoots are sprung an inch and a half, or two inches, they carefully remove one half of their covering, with a wooden rake, or with the hands, taking care not to disturb

or break the shoots. Light is requisite as well as air, to strengthen and establish the shoots; on which account a green-house has the advantage of a room, but a room answers very well with a good window or two in it, and if to the sun still better. In this manner they suffer them to remain till the planting season, giving them all the air possible by the doors and windows, when it can be done with safety from frost: by this method the shoots at the top become green, leaves are sprung, and are moderately hardy. They then plant them in rows, in the usual method, by a setting-stick; and carefully fill up the cavities made by the setting-stick; by this method they are enabled to bear a little frost without injury. The earliest potatoe is the superfine white kidney; from this sort, upon the same ground, have been raised four crops; having sets from the repository ready to put in as soon as the other were taken up; and a fifth crop is sometimes raised from the same lands, the same year, of transplanted winter lettuce. The first crop had the advantage of a covering in frosty nights. It is remarked that this useful information was communicated by J. Blundell, Ormskirk, and has hitherto been known only among a very few farmers.

4852. *The after culture of potatoes consists in harrowing, hoeing, weeding, and earthing up.* All potatoes require to be earthed up, that is, to have at least one inch in depth of earth heaped on their roots, and extending six or eight inches round their stem. The reason of this is, that the tubers do not, properly speaking, grow under the soil, but rather *on*, or just, partially, *bedded* in its surface. A coating of earth, therefore, is found, by preserving a congenial moisture, greatly to promote their growth and magnitude, as well as to improve their quality, by preventing the potatoes from becoming green on the side next the light. The earth may be thrown up from the trenches between the beds by the spade; or, where the potatoes are planted in rows, the operation may be performed with a small plough, drawn by one horse, or by the hoe. In Scotland, where the potatoe is extensively cultivated by the farmer, as food for cattle as well as man, the plough is universally used. In Ireland, where the bed, or lazy-bed manner is adopted, the earth is thrown up from the intervening trenches. The hoe is generally used by market-gardeners.

4853. *The after culture, where potatoes are planted in ridgelets, as above described (4850.), commences when the plants begin to rise above the surface.* They are then harrowed across, and afterwards the horse-hoe, or small hoeing plough, and the hand-hoe, are repeatedly employed in the intervals, and between the plants, as long as the progress of the crop will permit, or the state of the soil may require. The earth is then gathered once, or oftener, from the middle of the intervals towards the roots of the plants, after which any weeds that may be left must be drawn out by hand; for when the radicles have extended far in search of food, and the young roots begin to form, neither the horse nor hand-hoe can be admitted without injury.

4854. *The after culture adopted in some parts of Devonshire is somewhat singular and deserves to be noticed.* The sets are there generally cut with three eyes and deposited at the depth of three inches with the spade or dibber; when the first shoot is three inches high, prepare a harrow with thorns interwoven between the tines, and harrow the ground over till all the weeds are destroyed, and not a shoot of the potatoes left. It may seem strange that such an apparent destruction of a crop should cause an increase; but it may be affirmed as an incontestable fact, that by this means the produce becomes more abundant. The reason appears to be this; although three eyes are left to a piece of potatoe, one always vegetates before the others, and the first shoot is always single; that being broken off, there is for the present a cessation of vegetation. The other eyes then begin to vegetate, and there appear fresh shoots from the broken eye; so that the vegetation is trebled, the earth made loose, and the lateral shoots more freely expanded. If these hints are observed, the produce of potatoes, it is said, will exceed a fifth of the crop obtained by the usual mode of cultivation.

4855. *Pinching off the whole of the potatoe blossoms is a part of after culture not unworthy the attention of the farmer.* This may at first sight appear too minute a matter to enter into the economy of farm management. But when it is considered that the seed is the essential part of every plant, and that to which the ultimate efforts of nature are always directed, it will be allowed that an important part of the nourishment of every vegetable must be devoted for this purpose. In the case of the potatoe, every person knows that the weight of the potatoe-apples, grown by a single plant, is very considerable. Now we have seen (4837.) that apples may be produced instead of tubers in early potatoes, from whence it may justly be inferred, that more tubers may be produced in late ones by preventing the growth of the apples. Such was the reasoning of Knight, and by repeatedly making the experiment, he came to this conclusion, that in ordinary cases of field culture, by pinching off the blossoms of late crops of potatoes, more than one ton per acre of additional tubers will be produced. The experiments are related in the second volume of *The Horticultural Transactions*, and the practice is similar to one

common among the growers of bulbous roots in Holland, as alluded to by Dr. Darwin, who also recommends its application to the potatoe. A woman, or boy, will crop the blossoms from an acre of potatoes in a day, or even in less time where the crop is not excessively luxuriant.

4856. *The taking of the crop of potatoes* is on a small scale generally performed with the spade or three pronged fork; but under judicious farm management and the row culture by the common plough. The coulter is removed and the plough goes first along one side of all the ridgelets of a ridge, or any convenient breadth, and then, when the potatoes so brought to view are gathered by women placed at proper distances, it returns and goes along the other side. When the land is somewhat moist, or of a tenacious quality, the furrow-slice does not give out the roots freely, and a harrow which follows the plough is commonly employed to break it and separate them from the mould. Various contrivances have been resorted to for this purpose. A circular harrow or break to be attached to the plough, of very recent invention, has been found to answer the purpose well, and to effect a considerable saving of labor.

4857. *A mode of taking part of a crop* suited to cottagers and others, especially in years of scarcity, deserves to be mentioned. Having ascertained that some of the tubers have attained an eatable size, go along the rows and loosen the earth about each plant with a blunt stick, taking two or three of the largest tubers from each and returning the earth carefully. By this means both an early supply, and the advantage of two crops, may be obtained; for the tubers which remain will increase in size, having now the nourishment destined to complete the growth of those removed.

4858. *Potatoes intended for seed* should be taken up a fortnight or three weeks before fully ripe, for reasons that will be given in treating of the diseases of this plant. The ill shaped, small, bruised, or diseased tubers, should be laid aside, and the fairest and best dried in the sun, and spread on a cellar or loft floor, and covered with ashes or chaff of sufficient thickness to keep out the frost. In this state they may remain till wanted for cutting.

4859. *Potatoes are stored and preserved* in houses, cellars, pits, pies, and camps. Whatever mode is adopted, it is essential that the tubers be perfectly dry, otherwise they are certain of rotting, and a few rotten potatoes will contaminate a whole mass. Putting them into close houses, and covering them well up with dry straw, is the most effectual mode, and that which is generally adopted. In some parts of Scotland it is a common practice to dig pits in the potatoe-field, when the soil is dry and light, and, putting in potatoes to the depth of three or four feet, to lay a little dry straw over them, and then cover them up with earth, so deep that no frosts can affect them. Another method, which is practised in England as well as Scotland, is to put them together in heaps, and cover them up with straw, in the manner of preserving turnips, with this addition, that the heaps are afterwards well covered with earth, and so closely packed together as to exclude frost. The farmers in Lancashire sort and separate their potatoes in the course of taking them up according to their sizes, and are particularly careful to throw aside all those that are spoiled before raising, or that are cut in the taking up. This is a very necessary and proper precaution (although by no means generally attended to), as the crop must have a much better chance for keeping, than when diseased or cut potatoes are stored up with it. It is also of great advantage to have the work performed in a dry season, as the potatoes seldom keep well when taken up wet, or when placed in any sort of repository for keeping while in that state.

4860. *But the best way of storing potatoes*, Young says, is in what are called potatoe-pies. A trench, one foot deep and six wide, is dug, and the earth clean shovelled out, and laid on one side, this has a bedding of straw, and the one-horse carts shoot down the potatoes into the trench; women pile them up about three feet high, in the shape of a house roof; straw is then carefully laid on six or eight inches thick, and covered with earth a foot thick, neatly smoothed by flat strokes of the spade. In this method he never lost any by the severest frosts; but in cases of its freezing with uncommon severity, another coat of straw over all gives absolute security. These pies when opened, should each be quite cleared, or they are liable to depredation. To receive one at a time, besides also being at first filled for immediate use, he has a house that holds about 700 bushels, formed of posts from fir plantations, with wattled sides, then a layer of straw, and against that earth six feet thick at the bottom and eighteen inches at top; the roof flat, with a stack of beans upon it. This he has found frost tight. The beans keep out the weather, he says, and yet admit any steam which rises from the roots, which, if it did not escape, would rot them.

4861. *Several other modes of preserving potatoes* are in use in different places. In Rutlandshire, Marshal says, the method of laying up potatoes is universally that of camping them; a method somewhat similar to the above, but which requires to be described. Camps are shallow pits, filled and ridged up as a roof with potatoes; which are covered up with the excavated mould of the pit. This is a happy mean, he thinks, between bury-

ing them in deep pits, and laying them upon the surface. Camps are of various sizes; being too frequently made in a long square form like a corn-rick, and of a size proportioned to the quantity to be laid up. It has, however, been found by experience, that when the quantity is large, they are liable to heat and spoil; much damage having sometimes been sustained by this imprudence. Experienced campers hold that a camp should not be more than three feet wide; four feet is perhaps as wide as it can be made with propriety, proportioning the length to the quantity; or, if this be very large, forming a range of short ones by the side of each other. The usual depth is a foot. The bottom of the trench being bedded with dry straw, the potatoes are deposited, ridging them up as in measuring them with a bushel. On each side the roof long wheat straw is laid, neatly and evenly as thatch; and over this the mould raised out of the trench, is evenly spread; making the surface firm and smooth with the back of the spade. A coat of coal ashes is sometimes spread over the mould, as a still better guard against frost. It is needless to observe that a camp should have a dry situation; and that the roots ought to be deposited in as dry a state as possible. These camps are tapped at the end, some bawns, or a quantity of loose straw being thrust close in the opened end, as a bung or safeguard. As it is a matter of the highest importance to preserve this root without spoiling during the whole year, it has been suggested, that the best method yet discovered for keeping potatoes sound for the longest period, is to spread them on a dry floor early in the spring, and to rub off the eyes occasionally, as they appear to have a tendency to push out; by using these precautions, Donaldson has frequently seen potatoes kept in good condition till the month of June.

4862. *In Canada and Russia* the potatoe is preserved in boxes in houses or cellars heated to a certain temperature by stoves. (*Farm. Mag.* vol. xx. p. 449.)

4863. *To keep potatoes any length of time*, the most effectual way is to place them in thin layers on a platform suspended in an ice cellar. There the temperature being always below that of active vegetation they will not sprout, while not being many degrees below the freezing point the tubers will not be frost bit. Another mode is to scoop out the eyes by a very small scoop, and keep the roots buried in earth. A third mode is to destroy the vital principle by kiln drying, steaming, or scalding.

4864. *The produce of the potatoe* varies from five to eight, and sometimes ten or twelve tons per acre; the greatest produce is from the yam, which has been known to produce twelve tons or 480 bushels per acre. The haulm is of no use but as manure, and is very generally burned for that purpose, being slow of rotting.

4865. *The application of the potatoe crop* of the greatest importance is as human food, on which it is unnecessary to enlarge. Einhoff found mealy potatoes to contain twenty-four per cent. of their weight of nutritive matter, and rye seventy parts. Consequently sixty-four and a half measures of potatoes afford the same nourishment as twenty-four measures of rye. A thousand parts of potatoes yielded to Sir H. Davy from 200 to 360 parts of nutritive matter, of which from 155 to 200 were mucilage or starch, fifteen to twenty sugar, and thirty to forty gluten. Now, supposing an acre of potatoes to weigh nine tons, and one of wheat one ton, which is about the usual proportion, then as 1000 parts of wheat afford 950 nutritive parts, and 1000 of potatoe say 230, the quantity of nutritive matter afforded by an acre of wheat and potatoes will be nearly as nine to four; so that an acre of potatoes will supply more than double the quantity of human food afforded by an acre of wheat. The potatoe is perhaps the only root grown in Britain which may be eaten every day in the year without satiating the palate, and the same thing can only be said of the West India yam, and bread fruit. They are, therefore, the only substitute that can be used for bread with any degree of success, and indeed they often enter largely into the composition of the best loaf bread without at all injuring either its nutritive qualities or flavor. (*Edin. Encyc. art Baking.*) In the answer by Dr. Tissot to M. Linquet, the former objects to the constant use of potatoes as food, not because they are pernicious to the body, but because they hurt the faculties of the mind. He owns that those who eat maize, potatoes, or even millet may grow tall and acquire a large size; but doubts if any such ever produced a literary work of merit. It does not, however, by any means appear that the very general use of potatoes in our own country has at all impaired either the health of body or vigor of mind of its inhabitants.

4866. *The meal of potatoes* may be preserved for years closely packed in barrels, or unground in the form of slices; these slices having been previously cooked or dried by steam, as originally suggested by Forsyth, of Edinburgh. (*Encyc. Brit.*) Some German philosophers have also proposed to freeze the potatoe, by which the feculous matter is separated from the starch, and the latter being then dried and compressed, may be preserved for any length of time, or exported with ease to any distance. (*Annalen des Ackerbaues*, vol. iii. s. 389.)

4867. *The ordinary economical applications* of the potatoe, next to those of the culinary and baking arts, is in starch making and the distillery. Starch is readily made from the

scraped and washed tubers cut into small pieces and steeped in water; and a spirit is distilled from mashed potatoes fermented, so as to change a portion of the starch into sugar. In general it is found that three and a half bushels of potatoes afford the same quantity of spirit as one of malt.

4868. *Among extraordinary applications of the potatoe, may be mentioned cleaning woollens, and making wine and ardent spirit.*

4869. *Cleaning woollens.* The refuse of potatoes used in making starch when taken from the sieve, possesses the property of cleansing woollen cloths, without hurting their color; and the water decanted from the starch powder is excellent for cleansing silks, without the smallest injury to the color.

4870. *Wine, of considerable quality, may be made from frosted potatoes, if not so much frosted as to have become soft and waterish.* The potatoes must be crushed or bruised with a mallet, or put into a cider press. A bushel must have ten gallons of water, prepared by boiling it, mixed with half a pound of hops, and half a pound of common white ginger. This water, after having boiled for about half an hour, must be poured upon the bruised potatoes, into a tub or vessel suited to the quantity to be made. After standing in this mixed state for three days, yeast must be added to ferment the liquor. When the fermentation has subsided, the liquor must be drawn off, as fine as possible, into a cask, adding half a pound of raw sugar for every gallon. After it has remained in the cask for three months, it will be ready for use.

4871. *Ardent spirit.* Potatoes that have been injured by the frost, produce a much greater quantity of spirit, and of a much finer quality than those that are fresh; they require a proportion of malt-wash to promote the fermentation. About one-fourth part of malt-worts, or wash, ought to be fermented at least six hours before the potatoe wash is joined to it; otherwise the potatoe wash having an aptitude to ferment, will be ripe for the still before the malt-wash is ready; hence the effect will be, to generate an acid which renders the spirit coarse, and, when diluted with water, of a milky or bluish color. When the spirit is strong, the acid is held in solution; but appears as above, when diluted with water. (*Farmer's Mag.* vol. xvii. p. 325.)

4872. *In the application of potatoes as food for live-stock, they are often joined with hay, straw, chaff, and other similar matters, and have been found useful in many cases, especially in the later winter months, as food for horses, cows, and other sorts of live-stock.* With these substances, as well as in combination with other materials, as bean or barley-meal and pollard, they are used in the fattening of neat cattle, sheep and hogs. Potatoes are much more nutritive when boiled; they were formerly cooked in this way, but are now very generally steamed, especially in the north. The practice has been carried to the greatest extent by Curwen in feeding horses. He gives to each horse, daily, one and a half stone of potatoes mixed with a tenth of cut straw. One hundred and twenty stones of potatoes require two and a quarter bushels of coals to steam them. An acre of potatoes, he considers, goes as far in this way as four of hay. Von Thaeer found them, when given to live-stock, produce more manure than any other food: 100 lbs. of potatoes producing 66 lbs. of manure of the very best description. The baking of potatoes in an oven has also been tried with success. (*Comm. Board of Agriculture*, vol. iv.); but the process seems too expensive. They are also given raw to stock of every description, to horses and hogs washed, but not washed to cows or oxen. Washing was formerly a disagreeable and tedious business, but is now rendered an easy matter, whether on a large or small scale, by the use of the washing machine.

4873. *Frosted potatoes may be applied to various useful purposes, for food by thawing in cold water, or being pared, then thawed and boiled with a little salt. Salt, or saltpetre, chaff, or bruised oats, boiled with them, will render them fit food for cattle, swine, poultry, &c. Starch, and paste for weavers, bookbinders, and shoemakers, may be made from them when too sweet to be rendered palatable, and also an ardent spirit, from hydrometer proof to 10 per cent. over proof.*

4874. *The diseases of the potatoe are chiefly the scab, the worm, and curl. The scab, or ulcerated surface of the tubers, has never been satisfactorily accounted for. Some attributing it to the ammonia of horse-dung, others to alkali, and some to the use of coal ashes. Change of seed, and of ground, are the only resources known at present for this malady. The worm and grub both attack the tuber, and the same preventative is recommended. The only serious disease of the potatoe is the curl, and this is now ascertained to be produced by the too great concentration of the sap in the tuber, and this concentration, or thickening, is prevented by early taking up. This discovery was first made by the farmers near Edinburgh observing that seed potatoes procured from the moors, or elevated cold ground, in the internal parts of the country, never suffered from the curl, and it consequently became a practice, every three or four years, to procure a change of seed from these districts. On enquiry, it was found, that the potatoes in these upland grounds continued in a growing state till the haulm was blackened by the first frosts of October. They were then taken up, when, of course, they could not*

be ripe. Subsequent experiments, which will be found detailed in *The Farmer's Magazine*, and *Caledonian* and *London Horticultural Transactions*, have firmly established the fact, that the curl is prevented by using unripe seed, therefore the farmer ought to select his seed stock a fortnight or three weeks before he takes up the general crop, as already recommended. It is also a safe practice frequently to change the seed, and also to change the variety.

4875. *Sherrif*, an ingenious speculator and yet practical agriculturist, is of opinion that there are only two causes for the curled disorder in potatoes. The first is excessive seed bearing, that is, carrying great quantities of plums or apples; from the effects of which, if the plant be not too far advanced in life, it may recover for a time, by removing it to a shady or upland situation. The second cause is time or old age, which never fails ultimately to bring the curled or shrivelled disorder, followed by death, on the whole animal and vegetable kingdoms. An old decaying oak is an instance of the curled or shrivelled state of trees from age, as is "the lean and slipped pantaloons" of the curled disorder from old age in the human species. An apple tree, again, that has carried extraordinary crops of fruit within a few years, is often in the state of a potatoe curled from excessive apple bearing; so is a hart, or a buck, immediately after the rutting season. Both the tree and animals will recover their health and vigor for a time, unless they are too old, or have gone to the very greatest and last extremity in seed bearing and venerly, in which cases the effects will be the same as those of time, viz. death. It is not then to over-ripening the tubers that the curled disorder in potatoes is to be attributed, but to time and seed-bearing, that is, carrying great quantities of plums or apples.

Sect. II. *The Turnip*. — *Brassica Rapa*, L. *Tetrad. Siliq. L.* and *Cruciferae*, J. *Rave*, Fr.; *Rübe*, Ger.; and *Rapa*. Ital.

4876. *The turnip* is a native of Britain, but in its wild state is not to be recognized by ordinary observations from wild mustard. It was cultivated as food for cattle by the Romans; and has been sown for the same purpose in the fields of Germany and the low countries from time immemorial. When they were introduced in this country, as a field plant, is unknown; but it is probable turnips would be found in some gardens of convents from the time of the Romans; and it is certain that they were in field culture before the middle of the seventeenth century, though then, and for a long time afterwards, in a very inferior and ineffectual manner. It has been stated that turnips were introduced from Hanover in George I.'s time; but so far from this having been the case, George II. caused an abstract of the Norfolk system of turnip husbandry to be drawn up for the use of his subjects in Hanover. (*Campbell's Polit. Survey*, &c. vol. iii. p. 80.) The introduction of improved turnip culture into the husbandry of Britain, Brown observes, "occasioned one of those revolutions in rural art which are constantly occurring among husbandmen; and, though the revolution came on with slow and gradual steps, yet it may now be viewed as completely and thoroughly established. Before the introduction of this root, it was impossible to cultivate light soils successfully, or to devise suitable rotations for cropping them with advantage. It was likewise a difficult task to support live-stock through the winter and spring months; and as for feeding and preparing cattle and sheep for market during these inclement seasons, the practice was hardly thought of, and still more rarely attempted, unless where a full stock of hay was provided, which only happened in very few instances. The benefits derived from turnip husbandry are, therefore, of great magnitude. Light soils are now cultivated with profit and facility; abundance of food is provided for man and beast; the earth is turned to the uses for which it is physically calculated; and, by being suitably cleaned with this preparatory crop, a bed is provided for grass seeds, wherein they flourish and prosper with greater vigor than after any other preparation." (*Treatise on Rural Affairs*.)

4877. *Turnips and clover*, it is elsewhere observed, "are the two main pillars of the best courses of British husbandry; they have contributed more to preserve and augment the fertility of the soil for producing grain — to enlarge and improve our breeds of cattle and sheep — and to afford a regular supply of butcher's meat all the year, than any other crops; and they will probably be long found vastly superior, for extensive cultivation, to any of the rivals which have often been opposed to them in particular situations. Though turnips were long cultivated in Norfolk before they were known in the northern counties, yet it is an undoubted fact that their culture was first brought to perfection in Roxburghshire, Berwickshire, and Northumberland, and chiefly through the exertions of Dawson, of Frogden, in the first named county, and Bailey, of Chillingham, in the latter.

4878. *The varieties of turnip* grown by farmers may be arranged as whites and yellows.

4879. *Of white turnips*, by far the best and most generally cultivated, is the globe; but there are also the green topped, having the bulb tinged; greenish and purple topped, with the bulb reddish, which, though they do not produce so large a crop as the globe or oval, stand the winter better, and the red topped, it is said, will keep till February. The pudding, or tankard turnip, has a white bulb which rises from eight to twelve inches high, standing almost wholly above ground. It is less prolific than any of the others, and more liable to be attacked by frost.

4880. *Of yellow turnips*, there are the field yellow, which is more hardy than the globe, and answers well for succeeding that variety in spring; and the ruta бага, or Swedish

turnip, which may be preserved for consumption till June. The Siberian turnip has a bulb and a branchy top, but both of inferior quality. It is a hybrid between a white ruta бага and field cabbage, or between rape and cabbage.

4881. *New varieties* are obtained by selection and by counter impregnation; but in either case the greatest care is requisite to keep the plants at least a furlong from any others of the brassica tribe likely to flower at the same time, otherwise the progeny will certainly be hybridized.

4882. *The choice of sorts* may be considered as limited to the white globe, yellow, and Swedish, according as early, middling, or late supplies are wanted. No other varieties are grown by the best farmers.

4883. *In the choice of seed* the farmer must rely on the integrity of the seed-dealer, as it is impossible to discover from the grains whether they will turn out true to their kinds. Turnip-seed requires to be frequently changed; and the best is generally procured from Norfolk and Northumberland. The Norfolk seed, Forsyth observes, is sent to most parts of the kingdom, and even to Ireland: but after two years it degenerates; so that those who wish to have turnips in perfection, should procure it fresh every year from Norwich, and they will find their account in so doing. For, from its known reputation, many of the London seedsmen sell, under that character, seed raised in the vicinity of the metropolis, which is much inferior in quality.

4884. *Turnip-seed will grow of any age*, if it has been carefully preserved; that which is new comes up first, and therefore it is not a bad plan to mix new and old together, as a means of securing a braird against drought or the fly. Whether plants from new or old seed are most secure from the depredations of the fly, is perhaps a question which cannot be easily determined, even by experiments; for concomitant circumstances are frequently so much more operative and powerful as to render the difference between them, if there be any, imperceptible. It is, however, known to every practical man, that new seed vegetates several days before the old, and more vigorously; and it is equally well known that the healthy and vigorous plants escape the fly, when the stunted and sickly seldom or never escape it. Hence it would seem, that new seed, *ceteris paribus*, is more secure from the fly than old.

4885. *The soil* for turnips should always be of a light description. In favorable seasons very good crops may be raised on any soil; but from the difficulty of removing them, and the injury which the soil must sustain either in that operation, or in eating them on the spot with sheep, they never on such soils can be considered as beneficial to the farmer. Turnips cannot be advantageously cultivated on wet tenacious soils, but are grown on all comparatively dry soils under all the variations of our climate. On dry loams, and all soils of a looser texture, managed according to the best courses of cropping, they enter into the rotation to the extent of a fourth, a sixth, or an eighth part of the land in tillage; and even on clayey soils they are frequently cultivated, though on a smaller scale, to be eaten by cattle, for the purpose of augmenting and enriching the manure, into which the straw of corn is converted.

4886. *The climate* most desirable for the turnip is cool and temperate. This was long ago noticed by Pliny, and it is so obvious on the continent that it admits of no dispute. Von Thser observes, that the turnips grown on the fields of Germany seldom exceed half a pound in weight, and that all his care could not raise one beyond fourteen pounds. In France and Italy they are still less. A rapid climate is equally disadvantageous to the turnip; and they are accordingly found of no size in Russia, Sweden, and many parts of North America. Even turnips grown in the southern counties of England, in the same excellent manner as in Northumberland, never equal the size of those grown in the latter county, or further north, or in Ireland.

4887. *In the preparation of the soil*, the first ploughing is given with a deep furrow soon after harvest, usually in the direction of the former ridges; though, if the soil be dry, it is of little consequence in what direction. As soon as the spring seed-time is over, a second ploughing is given across the former, and the harrows, and, if necessary the rollers, are then set to work to clean and pulverize the soil. All the weed-roots that are brought to the surface are carefully gathered into heaps, and either burnt on the ground, or carried off to form a compost, usually with lime. The land is then generally ploughed a third time, again harrowed well, sometimes also rolled, and the weed-roots picked out as before. Unless land is in a much worse state, in regard to cleanliness and pulverization, than it usually is after turnips have been some time a rotation crop, no more ploughings are necessary. It is next laid up in ridgelets, from twenty-seven to thirty inches wide, either with the common swing-plough, or one with two mould-boards, which forms two sides of a ridgelet at once. Well-rotted dung, at the rate of twelve or fifteen tons per acre, is then carried to the field, and dropped from the cart in the middle one of three intervals, in such a quantity as may serve for that and the interval on each side of it. The dung is then divided equally among the three, by a person who goes before the spreaders, one of whom, for each interval, spreads it with a small three-pronged fork along the bottom. The plough immediately follows, and, reversing the ridgelets, forms new ones over the dung; and the drill-barrow, commonly one that sows two drills at once, drawn by one horse, deposits the seed as fast as the new drills are formed. This drill-machine is usually furnished with two small rollers; one

that goes before the sowing apparatus, and levels the pointed tops of the ridgelets, and another that follows for the purpose of compressing the soil and covering the seed. From the time the dung is carted to the ground, until the seed is deposited, the several operations should go on simultaneously; the dung is never allowed to lie uncovered to be dried by the sun and wind; and the new ridgelets are sown as soon as formed, that the seed may find moisture to accelerate its vegetation. (*Supp. Encyc. Brit. art. Agr.*)

4888. *Manure* may be considered as essential to turnips. Turnip-land, Brown observes, cannot be made too rich, for, in fact, the weight of the crop depends in a great measure upon its condition in this respect. Manure is sometimes applied to the crop which immediately precedes the turnips; but, to answer well in this way, the land must naturally be of an excellent quality. In other cases, where the land is in good order, it is laid on the stubble previous to the first ploughing. But generally the dung is laid on immediately before the seed is sown; the ground is formed into drills or ridges, and the manure spread in the intervals between them; the drills are then split by the plough, the earth on each side covers the dung, forms a drill where the interval formerly was, and furnishes a bed for the seed. These operations are now so well understood, that it is unnecessary to describe them more particularly. Farm-yard manure is the kind generally applied; it should be well rotted, and not less than twelve or fifteen tons allowed to each acre.

4889. *The time of sowing* the several varieties is somewhat different; the Swedish should be put in the earliest, and then the yellow, both of them in the month of May. But as these kinds are much less extensively cultivated than the globe, the month of June is the principal seed time; and after the first week of July a full crop is not to be expected in the northern parts of the island. But in the southern counties turnips are frequently sown in August after pease, wheat, or tares. The crop, however, is always light and only fit to be eaten down by sheep in spring, or to send their tops to market as greens. After a crop of hotspur pease sold green for the London market, the land is well cleared with the horse-hoe, and upon once ploughing, turnips are sown; and just before the young plants are observed to be cutting the ground, the field receives a light top-dressing of soot-ashes, or the most portable manure that can be conveniently procured. This dressing, upon frequent trial, has been found to have a very good effect in preserving the infant turnip plant from the depredations of the fly.

4890. *The preparation of turnip-seed* for sowing, by steeping in the drainings of dung-hills and other similar matters, has been recommended as a likely mode to prevent the fly; but it is not found to have this effect, and is never followed. Sometimes the following mode of preparation is adopted; half new and half old seed are mixed together; then half is taken and steeped in water for three or four hours; afterwards both steeped and unsteeped seed are mixed and immediately sown. The object of this preparation is to obtain four different brairds or risings of the seed, which is supposed to give four chances of escaping the fly which attacks the infant plants, instead of one. Another mode is to join to the above radish-seed, new and old, steeped in the above manner, it being found that the fly prefers the radish to the turnip. The most common precaution, however, as to the fly, is to sow thick, or to mix the seed with soot, lime, or ashes.

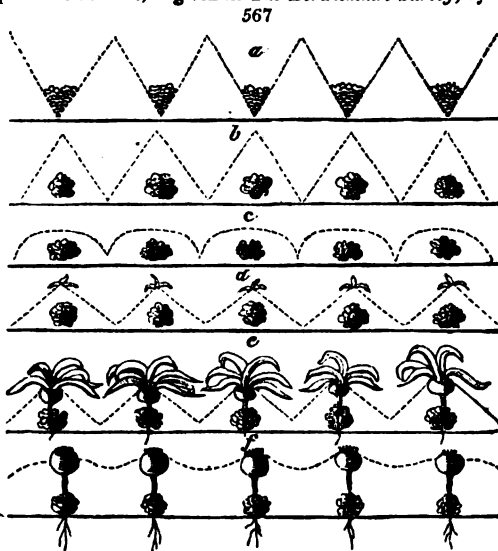
4891. *The quantity of seed* is usually from two to three pounds per acre.

4892. *The mode of sowing* in all the best cultivated districts is on raised drills. Not only the broad-cast, but even rows on a flat surface are rejected by all who understand the culture of the turnip. This plant never does any good in the field till its roots reach the dung; and therefore the only mode to ensure a heavy crop, is to put the dung immediately beneath the row. This is only to be done by the ridgelet, or raised drill system, as already explained in treating of preparing the soil. The drill used may be either the hand-drill, which sows one row at a time, and is pushed along by a woman, or by the horse-drill, which sows two rows. The latter from its weight and breadth performs the work with greater accuracy, and much more effectually than can be done by any hand machine. So much has been written to prove the disadvantages of sowing broad-cast, and the benefits of the drill system, that the subject may be considered as settled in favor of the latter, even in the case of midsummer sowing after early pease gathered green.

4893. *The after culture* may, in some cases, require to commence with watering by Young's excellent machine (2564.), though this has by no means found its way among farmers, and is only likely to be occasionally necessary. Some commence by strewing soot or lime along the row to annoy the fly, or sharp sand, ashes, or barley awns, to ward off the slug. In general, however, these practices are confined to gardens or cultivators on a very small scale, and like many others they are much oftener talked of than put in practice. The turnip farmer, as soon as the plants have put forth the *rough leaf*, or sooner if annual weeds have got the start of them, runs a horse-hoe between the ridgelets and cuts up the weeds on each side, almost close to the rows of the turnip plants, clearing out the bottom of the interval at the same time. The hand-boers are always set to work as

soon as possible after, and the plants are left about nine inches distant; the Swedish kind somewhat closer. If the ground has been well prepared, and the plants are allowed to get too large, three experienced hoers go over an acre a day. A few days after this, a small swing plough, drawn by one horse, enters the interval between the rows, and, taking a furrow-slice off each side, forms a smaller ridgelet in the middle. If the annuals still rise in great abundance, the horse-hoe may be employed again, otherwise the next operation is to go over them a second time with the hand-hoe, when the intermediate ridgelet is levelled. Sometimes a third hoeing must be given, but that is done very expeditiously. When no more manual labor is required, a small plough with two mould-boards is employed to lay up the earth to the sides of the plants, leaving the ridgelets of the same form as when sown, which finishes the process. Large fields throughout their whole extent, dressed in this manner, are left as clean and as pleasant to the eye as the best cultivated garden. The horse and hand-hoeing, in ordinary cases, may cost about fifteen shillings per acre. Where the soil is perfectly dry, and has been well prepared, the small plough has of late been laid aside by many farmers, and the space between the rows is kept clean by the horse and hand-hoe alone; but if the soil be either wet from springs, or so flat as not easily to part with surface water, it is still considered proper to earth up the roots as the concluding part of the process; and it is always useful to plough between the ridges when couch-grass and other weeds have not been completely picked out before the land was sown. The gathering of the weeds, the spreading of the dung, and the hand-hoeing, are almost always performed by women and boys and girls.

4894. A summary of turnip culture in drills, is given in *The Berwickshire Survey*, by a copper-plate. In this (fig. 567.) is first shown the ridgelets with the dung spread between (a), then the dung covered, and the drills formed (b); rolled and the seed sown (c); the young plants with the earth hoed away from them by a curved coulter hoe (d); the plants further advanced, covering the soil with their leaves, and enjoying the dung with their roots (e); and full grown, the leaves being cut off in November, to be eaten green, and the bulbs left for winter use. (f)



4895. The turnip crop is generally taken and consumed at the same time. They are consumed either on the spot where they grow; on grass-fields; in fold-yards; or in feeding-houses; but the far greater part, wherever they are extensively cultivated, by sheep. The price per acre when sold depends not only upon the weight of the crop, but also on the mode of its consumption.

4896. When eaten by sheep in the place of their growth, turnips are lotted off, by means of hurdles or nets, that they may be regularly consumed. When the first allowance is nearly eaten up, the bottoms or shells are picked out of the ground, by means of a two-pronged blunt hook adapted to the purpose; and then another portion of the field is taken in, by shifting the hurdles or nets, and so on regularly until the whole are finished; the cleared part of the field being usually left accessible as a drier bed for the sheep, and that they may pick up what shells remained when a new portion of the field was taken in.

4897. The turnips required for other modes of consumption are usually drawn out, at regular intervals, before the sheep are put upon the field; unless the soil be so poor as to need all the benefit of their dung and treading, in which case, the whole are consumed where they grow; or so rich as to endanger the succeeding crops, by eating any part of the turnips on the ground. In the latter very rare instance, the whole crop is carried to be consumed elsewhere, as must always be done, if the soil be naturally too wet for sheep feeding. In wet weather, when sheep ought not to be allowed to lie on the turnip field, it becomes necessary to carry the turnips to a grass field; and store sheep, not requiring to be so highly fed, frequently eat their turnips on such fields, as well as rear-

ing cattle, and sometimes milk cows. A grass field contiguous to the turnip one is always very desirable, that the sheep confined on other sides by hurdles or nets, may always find a dry place to lie on.

4898. In the *expenditure of turnips to young cattle*, and to sheep in their first year towards spring, when the loosening and shedding of their teeth render them unable to break the large roots, it is usual to cut or slice the turnips, either by means of a spade, or chopping knife, or by an implement constructed for the purpose, called a turnip-slicer, formerly mentioned (2456.); or they are crushed by means of a heavy wooden mallet.

4899. *During severe frosts*, turnips become so hard that no animal is able to bite them. The best remedy in this case is, to lay them for some time in running water, which effectually thaws them; or, in close feeding houses, the turnips intended for next day's use, may be stored up over night, in one end of the building, and the warmth of the animals will thaw them sufficiently before morning. But in those months when frosts are usually most severe, it is advisable to have always a few days' consumption in the turnip barn. When a severe frost continues long, or if the ground be covered deep with snow, potatoes ought to be employed as a substitute.

4900. *The advantages of eating turnips on the place of their growth by sheep*, both in manuring and consolidating the ground, are sufficiently well known to every farmer. One great defect of the inferior sort of turnip soil is the want of tenacity; and it is found that valuable crops of wheat may be obtained upon very light porous soils, after turnips so consumed. It is not uncommon to let turnips at an agreed price, or board, for each sheep or beast weekly. This varies according to age and size, and the state of the demand, from four-pence or less, to eight-pence or more for each sheep weekly, and from two shillings to five for each beast. An acre of good turnips, say thirty tons, with straw, will fatten an ox of sixty stone, or ten Leicester sheep. Supposing the turnips worth six guineas, this may bring the weekly keep of the ox to six shillings and three-pence halfpenny, and of the sheep to about seven-pence halfpenny a week. In this way of letting, however, disputes may arise, as the taker may not be careful to have them eaten up clean. The person who lets the turnips has to maintain a herd for the taker; and when let for cattle, and consequently to be carried off, the taker finds a man and horse, and the latter maintaining both. The taker has to provide hurdles or nets for fencing the allotments to sheep; but the latter must fence his own hedges if necessary. The period at which the taker is to consume the whole is usually fixed in the agreement, that the seller may be enabled to plough and sow his land in proper season. (*Suppl. to Encyc. Brit. art. Agr.*)

4901. *The Swedish and yellow turnip* are eaten greedily by horses; and afford a very nutritive and salutary food along with hay or straw for working stock. The best mode is to steam them after previously passing them through the slicing machine, as no root requires so much cooking as the Swedish turnip. Horses will also eat the white turnip, but not freely, unless they have been early accustomed to them, as in some parts of Norfolk.

4902. *Near large towns* the most profitable mode of disposing of turnips, is to the cow-keepers and green-grocers.

4903. *The application of turnips in domestic economy* is well known. They may also be used in the distillery, and a wine is said to be made from them by the London manufacturers of imitations of foreign wine.

4904. *The storing of turnips* is attended with too much labor and risk, to be of much advantage in the greater part of the kingdom. Common turnips are never stored in any great quantity, though sometimes a portion is drawn and formed into heaps, like potatoe camps, and lightly covered with straw, or preserved for some time under a shed. On these occasions, the shaws or leaves, and the tap-roots, must be cut off and removed before storing up, to prevent heating and rotting. The heaps must not be covered with earth like potatoes, for in this case their complete destruction is inevitable. This root contains too much water to be preserved for any length of time in a fresh and palatable state, after being removed from the ground; and though the loss in seasons unusually severe, particularly in the *white globe* variety, is commonly very great, it is probable that a regular system of storing the whole, or the greater part of the crop every season, would, upon an average of years, be attended with still greater loss; besides the labor and expense, where turnips are cultivated extensively, would be intolerable. (*Supp. &c.*)

4905. *Taking up and replacing* is a mode by which turnips have been preserved, by Blaikie, of Holkham, and some others. The mode is to cart the turnips from the field where they grow, to a piece of ground near the farm-offices before the winter rains set in, when the tap-root being cut off, the plants are set on the surface of the ground, in an upright position, as close to each other as they can stand, where they keep much better than in a store, during the whole season. And the advantages of having them quite close to the homestead, in place of bringing them most probably from a distant part of the farm in

wet or stormy weather, are so obvious, as fully to justify a recommendation of the practice.

4906. *Replacing and earthing* have also been tried with success, especially with the Swedish turnip. Being pulled and freed from their roots and leaves, they are carted to a piece of well worked dry soil near the farmery, and there deposited in rows, so close as nearly to touch each other in the bottom of shallow furrows, the plough covering one row as another furrow is opened. In this way many tons are quickly earthed in, and on a very small space, and they can be turned out when wanted with equal facility. (*Farmer's Magazine*, vol. xiii. p. 282.)

4907. *The produce of turnips* cultivated in the broad-cast manner in England, varies from five to fifteen tons per acre: the latter is reckoned a very heavy crop. In Northumberland and Berwickshire, a good crop of white globe turnips drilled usually weighs from twenty-five to thirty tons per acre, the yellow and Swedish commonly a few tons less. Of late there have been instances of much heavier crops, and in Ayrshire, it would appear, that above sixty tons have been raised on an English acre, the leaves not included. (*Farmer's Magazine*, vol. xv. and xvi.) But such an extraordinary produce must have been obtained by the application of more manure than can be provided, without injustice to other crops, from the home resources of a farm; and where turnips form a regular crop in the rotation, no such produce is to be expected under any mode of culture.

4908. *The produce of the turnip in nutritive matter*, as proved by Sir H. Davy, was forty-two parts in a thousand; of which seven were mucilage, thirty-four sugar, and one gluten. Swedish turnips afforded sixty-four parts in a thousand of nutritive matter, of which nine were starch, fifty-one sugar, two gluten, and two extract. According to Van Thaer, 100 lbs. of turnips are equal to twenty-two of hay; and an ox to get fat on turnips ought to have one-third of its weight daily.

4909. *To raise turnip seed*, the usual mode is to select the most approved specimens of the variety to be raised at the season when they are full grown, and either remove all others from the field and leave them to shoot into flower stems next year, or to transplant them to a place by themselves where they will be secure from the farina of other plants of their genus. In either case they must be protected by earthing up from the winter's frost and rains, and in the ripening season from the birds.

4910. *The Norfolk seed growers* have a sort of theory on the subject of transplanting turnips for seed which it may be worth while to attend to. According to that theory where turnip seed is collected from such turnips as have been sown three or four years in succession, the roots are liable to be numerous and long, and the necks or parts between the bulbs and leaves coarse and thick: and when taken from such as have been transplanted every year, these parts are liable to become too fine, and the tap-roots to be diminished in too great a proportion. Of course the most certain plan is to procure seed from turnips that are transplanted one year and sown the next; or, if they be transplanted once in three years, it is supposed, that the stock may be preserved in a proper state of perfection. It is stated, that the method of performing this business in the best way, is to select such turnips as are of the best kinds and of the most perfect forms, from the field crops, and, after cutting their tops off, to transplant them, about the month of November, or following month, into a piece of ground that has been put into a fine state of tillage by repeated ploughing or digging over, and which should be situated as near the house as it can be, in order that the birds may be better kept from it. The seed will mostly be ready for gathering in the end of July, or in the following month.

4911. *Other cultivators*, however, advise that the seed collected from a few turnips thus transplanted, should be preserved and sown in drills, in order to raise plants for seed for the general crop, drawing out all such as are weak and improper, leaving only those that are strong and which take the lead; and that when these have formed bulbs, to again take out such as do not appear good and perfect, as by this means turnip seed may be procured, not only of a more vigorous nature, but which is capable of vegetating with less moisture, and which produces stronger and more hardy plants. The practice of transplanting the whole of the turnips for seed for the main crops being contended to be not only highly expensive, but injurious, by diminishing the strength of the plants from the destruction of their tap-roots. Very good seed may, however, be raised in either of the methods that have been here described.

4912. *After the seed has become fully ripened*, it is mostly reaped by cutting off part of the stems, and afterwards tying them up into sheaves, which, when sufficiently dry, are put into long stacks, and kept through the winter, in order to be threshed out about the time when it is wanted. But as in this way much seed is liable to be lost, by its readiness to escape from the pods in which it is contained, it is advised as a much better practice to have it immediately threshed out, either upon a cloth in the field where it grew, or in some other convenient place, being then put into bags proper for the purpose and placed in a situation which is perfectly dry. From seed crops of this sort being subject to much injury and loss in different ways, the quantity of produce must be very different under different circumstances; but it may in general be stated at not less than from twenty to twenty-four bushels the acre. And the price of turnip seed being seldom less than seven or eight shillings the bushel, on account of the great demand for it, it may at first appear to be a very advantageous sort of culture; but from the exhausting nature of the crop, the loss sustained in grain, and the quantity of manure afterwards necessary, it is probable that turnip seed can only be grown to advantage in particular circumstances of soil and situation. In most cases it is, however, well for the farmer to raise his own seed, as that of the shops is seldom to be fully depended upon.

4913. *The diseases and injuries to which turnips are liable* are various. At their first appearance their leaves are liable to the attacks of the fly (*Aphis*, and *Crysmela*, L.), of the caterpillar (*Papilio noctua*, &c. L.), of the slug (*Limex*, L.), and of the mildew. Their bulbs and roots are attacked by worms of different kinds; by a singular tendency to monstrosity, known provincially by the name of fingers and toes; by the anbury; by canker, and by wasting or gangrene from water or frost. Of all or most of these injurious diseases, it may be observed, that they neither admit of prevention or cure by art. Under

favorable circumstances of soil, climate, culture, and weather, they seldom occur; and therefore all that the cultivator can do is to prepare and manure his land properly, and in the sowing season supply water when the weather is deficient in showers or the soil in humidity.

4914. *The fly* attacks the turnip when in the seed-leaf, and either totally devours it, or partially eats the leaves and centre-bud, so as to impede the progress of the plants to the second or rough leaves. Whether the eggs of these flies are deposited on the plants or in the soil, does not appear to be ascertained; in all probability they are attached to the former, as in the gooseberry caterpillar, and most cases of flies and insects which feed on plants. Preparations and mixtures of the seed, as already treated of (4890.), is all that has yet been done in the way of preventive to this evil.

4915. *The caterpillar* makes its appearance after the plants have produced three or more rough leaves; these they eat through, and either destroy or greatly impede the progress of the plants. There can be little doubt that the eggs of these caterpillars are deposited on the leaves of the plants by a species of moth, as the caterpillar may be detected when not larger in diameter than a hair. As preventives to the moths from fixing on the turnips for a deposit for their eggs, it has been proposed to place vessels with tar in different parts of the field, the smell of which is known to be very offensive to moths and all insects; by causing a thick offensive smoke to pass over the ground at the time when it is supposed the moths or parent flies were about to commence their operations. To destroy the caterpillar itself, watering with tobacco water, lime water, strong brine, and laying on ashes, barley awns, &c. have been proposed.

4916. *The slug and snail* attack the plants both above and under ground, and eat both the leaves and roots. Rolling, soot, quick-lime, awns, &c. have been proposed to annoy them; but the only effectual mode is, immediately after the turnips are sown, to strew the ground with cabbage leaves, or leaves of any of the Brassica tribe. On these the slugs will pasture, especially if they be beginning to decay (which produces a sweetness), and may be gathered off by women or children every morning. By procuring as many cabbage leaves, or handfull of decaying pea haulm, or any similar vegetable, as will go over a ridge or two, say at the rate of a leaf to every square yard, a whole field may soon be cleared by picking off the slugs and removing the leaves once in twenty-four hours. This mode we have found most effectual in clearing a whole field of slugs, and it is extensively practised by market and other gardeners. (*Encyc. of Gard.* § 2275.)

4917. *The mildew* and blight attack the turnip in different stages of its progress, and always retard its growth. Its effects may be palliated by watering and strewing the leaves with sulphur; but this will hardly be considered applicable to whole fields.

4918. *The worms which attack the roots*, when they commence their ravages at an early period, impede their growth, and ruin or greatly injure the crop. They admit of no remedy or prevention.

4919. *The forked excrescences*, known as fingers and toes, is considered an alarming disease, and hitherto it can neither be guarded against nor cured. The following account of it is given by William Spence, president of the Holderness Agricultural Society in 1811. "In some plants, the bulb itself is split into several finger diverging lobes. More frequently the bulb is externally tolerably perfect, and the tap-root is the part principally diseased; being either wholly metamorphosed into a sort of misshapen secondary bulb, often larger than the real bulb, and closely attached to it, or having excrescences of various shapes, frequently not unlike human toes, (whence the name of the disease,) either springing immediately from its sides, or from the fibrous roots that issue from it. In this last case, each fibre often swells into several knobs, so as distantly to resemble the runners and accompanying tubers of a potatoe; and not seldom one turnip will exhibit a combination of all these different forms of the disease. These distortions manifest themselves at a very early stage of the turnip's growth; and plants, scarcely in the rough leaf, will exhibit excrescences, which differ in nothing else than size from those of the full-grown root.

4920. *The leaves discover no unusual appearance*, except that in hot weather they become flaccid and droop; from which symptom, the presence of the disease may be surmised without examining the roots. These continue to grow for some months, but without attaining any considerable size, the excrescences enlarging at the same time. If divided at this period with a knife, both the bulb and the excrescences are found to be perfectly solid, and internally to differ little in appearance from a healthy root, except that they are of a more mealy and less compact consistency, and are interspersed with more numerous and larger sap-vessels. The taste, too, is more acrid; and, on this account, sheep neglect the diseased plants. Towards the approach of autumn, the roots, in proportion as they are more or less diseased, become gangrenous and rot, and are either broken (as frequently happens) by high winds, or gradually dissolved by the rain. Some, which have been partially diseased, survive the winter; but of the rest, at this period, no other vestige remains than the vacant patches which they occupied at their first appearance.

4921. *This disease is not owing to the seed, nor to the time of sowing, nor to any quality of the soil*, either original or induced by any particular mode of cropping or of tillage; and Spence adds, that the most attentive and unbiased consideration of the facts has led him to infer that the disease, though not produced by any insect that has yet been discovered, is yet caused by some unobserved species, which either biting the turnip in the earliest stage of its growth, or insinuating its egg into it, infuses at the same time into the wound a liquid which communicates to the sap-vessels a morbid action, causing them to form the excrescences in question.

4922. *For the prevention of this disease*, marl has been recommended by Sir Joseph Banks and others; and where marl cannot be procured, it has been thought that an addition of mould of any kind, that has not borne turnips, will be advantageous; such as a dressing taken from banks, woodlands, ditches, &c. and mixed up with a good dose of lime. But lime alone has been tried in vain; and no great dependence can be placed upon fresh mould, as this disease has been known to prevail upon lands that had scarcely ever before borne a crop of turnips. (*Farmer's Magazine*, vol. xiii.)

4923. *The anbury* is a disease in the roots of turnips which is thus described by Marshal in his *Rural Economy of Norfolk*:—It is a large excrescence, which forms itself below the apple. It grows to the size of both the hands, and, as soon as the hard weather sets in, or it is, by its own nature, brought to maturity, becomes putrid, and smells very offensively. At present, the state of three specimens which have been taken up and examined attentively, is this:—The apples of the turnips are just forming (about the size of walnuts in the husk), while the anburies are already as big as the egg of a goose. They are irregular and uncouth in their form, with inferior excrescences (resembling the lobes of ginger) hanging to them. On cutting them, their general appearance is that of a hard turnip; but on examining them through a magnifier, there are veins, or string-like vessels, dispersed among the pulp. The smell and taste somewhat resemble those of turnips, but without their mildness, having an austere and somewhat disagreeable flavor, resembling that of an old stringy turnip. The tops of those which are much affected, turn yellow, and flag with the heat of the sun; so that, in the day-time, they are obviously distinguishable from those which are healthy. It seems to be an idea among farmers, that the cause of the anbury is the soil being tired of turnips; owing to their having been too often sown on the same land. This, however, Marshal says, is positively erroneous; for the piece from which these specimens were drawn, was an old orchard, and never before bore turnips in the memory of man. The cause of this disease is probably not yet well ascertained; but if drought does not immediately produce it, the coincidence of a remarkably dry season, and a remarkably anburied turnip crop, justifies a suspicion, that the former does in some measure contribute to promote the latter. Marshal seems, indeed, to conceive that it is caused by some kind of grub or other, that, wounding the vessels of the tap-root, diverts the course of the sap; which, instead of forming the apple, forms this excrescence.

4924. *The canker* attacks the roots and partly the bulbs of turnips, and is known by the ulcerated appearance it produces. Some consider it owing to the presence of too much iron in the soil, and recommend liming as a preventive.

4925. *Wasting and putrefaction*, from excess of water or frost, are to be prevented by earthing up the bulbs, or taking up and storing.

Sacr. III. *The Carrot*.—*Daucus carota*, L. *Pentan. Dig. L.* and *Umbelliferae*, J. *Carotte*, Fr; *Gelbe Rübe*, Ger.; and *Carota*, Ital.

4926. *The carrot* is a biennial plant, a native of Britain; but though long known as a garden plant it is comparatively but of recent introduction in agriculture. It appears to have been cultivated from an early period in Germany and Flanders, and introduced from the latter country to Kent and Suffolk early in the 16th century. As the carrot requires a deep soil inclining to sand, it can never enter so generally into cultivation as the potatoe or turnip. But as observed by a judicious writer, it has been too much neglected on lands where it would have yielded a more valuable product, perhaps, than any bulbous or tap-rooted plant whatever. Several contradictory experiments in its culture have been detailed in a number of publications, from which the practical husbandman will be at a loss to draw any definite conclusion. But, in a recent communication to the Board of Agriculture, from Robert Burrows, an intelligent Norfolk farmer, who has cultivated carrots on a large scale, and with great success, for several years, so accurate an account is presented of the culture, application, and extraordinary value of this root, that carrots will probably soon enter more largely into the rotation of crops on suitable soils. (*Supp. &c.*)

4927. *The varieties of carrot* cultivated in gardens are numerous and readily increased by the usual means; but the only sort adapted for the field is the long-red or field carrot. New seed is most essential, as it will not vegetate the second year. Old seed, or a mixture of old and new, and also the mixture of the horn carrot, the seed of which is sent over in large quantities from Holland, ought to be carefully avoided.

4928. *The best soil for the carrot* is a deep rich sandy loam; such a soil ought at least to be a foot deep, and all equally good from top to bottom. On any other the field culture of the carrot will not answer.

4929. *In preparing the soil for the carrot*, it is essential to plough it before winter that it may be pulverized by frost; and to work it well by the plough and cultivator in spring, to at least the depth of a foot. This deep tillage may be perfectly accomplished

either by means of the trench-plough following the common one, or by the common one alone, with a good strength of team; but the former method is to be preferred, wherever the lands are inclined to be stiff or heavy. Three ploughings are mostly found sufficient, where the land has been previously in a state of tillage; but more may in other cases be necessary. The first ploughing should be made to the depth of ten, twelve, or fourteen inches, and be performed when the soil is tolerably dry, about the beginning of October. It may remain in this condition till towards the middle of February, when it should be turned over a second time, but in a cross direction, to nearly the same depths. In March, a third ploughing may be given, in order to the putting in of the seed. This may be somewhat lighter than the preceding ones. As soon as the last ploughing has been given in March, the land should be harrowed, and the surface made as fine as possible.

4930. *In Suffolk the farmers sow carrots after turnips, barley, and pease set upon a rye-grass ley; the crops upon the first have generally been most productive; next to that they prefer the latter. In the first place they feed off the turnips by the beginning of February, and then lay the land up on small balks or furrows, in which state it remains till the second week in March, when it is harrowed down, double-furrowed to the depth of about twelve inches, and the seed sown.*

4931. *The climate most suitable to the carrot is the same as for the turnip; but they will thrive better than the turnip in a dry and warm climate, and are consequently of better growth in the south of England and France, in proportion to their size, in moist climates as Holland and Ireland, than the turnip.*

4932. *Manure, according to some, should not be given to carrots the year they are sown, as it is alleged when the roots meet with it they become forked, scabbed, and wormy. This, however, is chiefly applicable to cases in which recent unfermented manure has been given, or where other manure has not been properly broken in pieces and spread over the soil or in the drills. The Suffolk and Norfolk farmers, who are the best carrot growers, always use dung; a suitable proportion of well-rotted farm-yard dung being constantly turned into the soil at the last ploughing in March, as it has been fully shewn, by various trials detailed in *The Annals of Agriculture*, and other books on husbandry, that, though good crops of carrots may be occasionally grown without the use of manure, it is only by the liberal application of that substance that the greatest produce possible can be obtained, as they are in general found to bear a relative proportion to the quantity that may have been employed.*

4933. *Burrows prepares the land with a good dressing of about sixteen cart loads per acre of rotten farm-yard manure, or cottager's ashes: the load about as much as three able horses can draw, and, if bought, costs about four shillings and sixpence per load, besides the carting on the land. He usually sows wheat stubbles after clover, ploughing the first time in autumn, and once more in the early part of the month of February, if the weather permits; setting on the manure at the time of sowing, which is about the last week in March, or sometimes as late as the second week in April.*

4934. *In Suffolk, when carrots are intended to be sown after pease, they usually plough the stubble as soon as the harvest is over, in order that the land may clear itself of weeds; in December, it is laid up in small balks to receive the benefit of the frosts; in February, it is harrowed down, and manured at the rate of fifteen loads per acre; the manure is ploughed in to the depth of about four inches, and in the month of March the land is double-furrowed, and the seed sown. By pursuing this method, they say, the manure lies in the centre of the soil, and not only affords nourishment and support to the carrot in its perpendicular progress, but renders it easy to be turned up by a single ploughing, and greatly promotes the growth of the succeeding crop of barley. In Norfolk, it is the practice to sow carrots after a crop of turnips. The manure, after being put on the land in the beginning of March, is first ploughed in with a common plough, and afterwards trench-ploughed about fourteen or fifteen inches deep; it is then harrowed very fine, and the seed sown about the middle of March.*

4935. *The season for sowing the carrot preferred by Burrows, is the last week in March or first in April; but he prefers the first period, having generally found early sown crops the most productive.*

4936. *The usual preparation of the seed for sowing is by mixing it with earth or sand, to cause it to separate more freely; but Butrows adds water, turns over the mixture of seeds and moist earth several times, and thus brings it to the point of vegetating before he sows it. "Having weighed the quantity of seed to be sown, and collected sand or fine mould, in the proportion of about two bushels to an acre, I mix the seed with the sand or mould, eight or ten pounds to every two bushels, and this is done about a fortnight or three weeks before the time I intend sowing; taking care to have the heaps turned over every day, sprinkling the outside of them with water each time of turning over, that every part of the sand heaps may be equally moist, and that vegetation may take place alike throughout. I have great advantage in preparing the seed so*

long beforehand; it is by this means in a state of forward vegetation, therefore lies but a short time in the ground, and by quickly appearing above ground, is more able to contend with those numerous tribes of weeds in the soil, whose seeds are of quicker vegetation." (*Supp. &c.*)

4937. *Crude*, the French translator of Von Thae's work, describes in a note (*tom. iv. 237.*) a practice nearly similar to that of Burrows. *Crude* uses *sciure* (night soil) instead of earth, and waters with the drainings of dunghills. He keeps the mixture in a warm, but shady situation for eight days; by that time the seed is nearly ready to vegetate, and he sows it immediately.

4938. *The quantity of seed* when carrots are sown in rows, is two pounds per acre, and for broad-cast sowing five pounds. Burrows sows ten pounds per acre in the broad-cast manner.

4939. *The usual mode of sowing* the carrot is broad-cast; but a much better mode in our opinion would be to sow them in rows at twelve or fourteen inches distance; drawing the drills, and hoeing the intervals by any suitable drill and hoe. The most common practice, however, when carrots are best cultivated, is the hand or broad-cast method, the seed being dispersed as evenly as possible over the land, after the surface has been reduced to a very fine state of pulverisation by harrowing, in order to provide a suitable bed for it to vegetate in; being then covered in by means of a light harrow. As the seed of the carrot is not of a nature to be deposited with much regularity by the drill, and as the young plants can be easily set out to proper distances in the operation of hoeing, this is probably the most appropriate method of putting such sort of seed into the ground. And an additional proof of it is indeed found, in its being that which is almost universally adopted in those districts where carrot-husbandry is practised to the greatest extent. But with the view of having the after-culture of the crops more perfectly performed, and at the same time to save the great expense of hand-labor in hoeing the crop, the drill method has been attempted by some cultivators, but we believe without complete success. The work is finished in equi-distant rows at the distance of from twelve to fifteen or eighteen inches from each other, according to the mode of hoeing that is practised. In this business some cultivators do not make use of drill-machines, but strike the land into small furrows by hoes or other implements contrived for the purpose, and then cast the seed over the ground by the hand, covering it in either by slight harrowing, or hoeing in the tops of the ridgelets. It is added, that "in this method, where a drill-machine is used, it has been advised by an intelligent cultivator to deposit the seed to the depth of one inch in the rows, leaving the spaces of fourteen inches between them as intervals; the seed in these cases being previously steeped in rain-water for twenty-four hours, and left to sprout, after which it is mixed with saw-dust and dry-mould, in the proportion of one peck and a half of each to a pound of the seed. The land is afterwards lightly harrowed over once in a place. Two pounds of seed in this mode is found, as has been observed, sufficient for an acre of land."

4940. *The after-culture* given the carrot consists entirely of hoeing and weeding. In Suffolk they are hoed generally three times in the season. The first time, as soon as the plants can be distinguished from the weeds which surround them, which should be done with three-inch hoes, having handles not above two feet in length. It is an operation that requires to be performed with great attention, as it is extremely difficult to distinguish and separate the young carrots from the weeds. The second hoeing should be given in three or four weeks afterwards, according to the forwardness of the crop; it may be performed with common hoes, care being taken to set out the plants at proper distances. From eight to fifteen or eighteen inches, each way, is the common distance at which they are allowed to stand; and it has been proved, from many years' experience, in districts where they are most cultivated, that carrots which grow at such distances always prove a more abundant crop than when the plants are allowed to stand closer together. The third hoeing is commonly made about the middle or end of June, and in this, besides destroying the weeds, another material circumstance to be attended to, is to set out the carrots at proper distances, and also, wherever any have been left double at the former hoeings, to take the worst of the two plants away.

4941. *Carrots sown according to the plan of Burrows*, are ready to hoe within about five or six weeks. He hoes three and sometimes four times, or until the crop is perfectly clean: the first hoeing is with hoes four inches long, and two and a quarter inches wide. The second hoeing invariably takes place as soon as the first is completed, and is performed with six-inch hoes, by two and a quarter inches wide. By this time the plants are set; the first time of hoeing nothing was cut but the weeds. He leaves the plants nine inches apart from each other; sometimes they will be a foot, or even farther asunder.

4942. *Carrots are taken up* generally in the last week of October. Burrows's practice is to let the work to a man who engages women and children to assist him;

the work is performed with three-pronged forks; the children cut off the tops, laying them and the roots in separate heaps, ready for the teams to take away. "I take up in autumn a sufficient quantity to have a store to last me out any considerable frost or snow that may happen in the winter months; the rest of the crop I leave in the ground, preferring them fresh out of the earth for both horses and bullocks. The carrots keep best in the ground, nor can the severest frosts do them any material injury; the first week in March, it is necessary to have the remaining part of the crop taken up, and the land cleared for barley; the carrots can either be laid in a heap with a small quantity of straw covered over them, or they may be laid into some empty outhouse or barn, in heaps of many hundred bushels, provided they are put together dry. This latter circumstance, it is indispensably necessary to attend to, for if laid together in large heaps when wet, they will certainly sustain much injury. Such as I want to keep for the use of my horses until the months of May and June, in drawing over the heaps, (which is necessary to be done the latter end of April, when the carrots begin to sprout at the crown very fast), I throw aside the healthy and most perfect roots, and have their crowns cut completely off and laid by themselves; by this means, carrots may be kept the month of June out in a high state of perfection." (*Communications to the Board of Agriculture*, vol. vii. p. 72.)

4943. *The storing a whole crop of carrots* may be a desirable practice when winter wheat is to follow them, in which case the same mode may be adopted as for turnips or potatoes, but with fewer precautions against the frost, as the carrot, if perfectly dry, is very little injured by that description of weather.

4944. *The produce of an acre of carrots in Suffolk*, according to Arthur Young, is at an average 350 bushels; but Burrows's crops averaged upwards of 800 bushels per acre, which considerably exceeds the largest crop of potatoes.

4945. *The uses to which the carrot is applied in Suffolk* are various. Large quantities are sent to the London markets, and also given as food to different kinds of live stock. Horses are remarkably fond of carrots, and it is even said, that when oats and carrots are given together, the horses leave the oats and eat the carrots. The ordinary allowance is about forty or fifty pounds a day to each horse. Carrots when mixed with chaff, that is, cut straw, and a little hay, without corn, keep horses in excellent condition for performing all kinds of ordinary labor. The farmers begin to feed their horses with carrots in December, and continue to give them chiefly that kind of provender till the beginning or middle of May; to which period, with proper care, carrots may be preserved. As many of the farmers in that country are of opinion that carrots are not so good for horses in winter as in spring, they give only half the above allowance of carrots at first, and add a little corn for a few weeks after they begin to use carrots.

4946. *The application of the carrot to the feeding of working cattle and hogs* is thus detailed by Burrows. "I begin to take up the carrot crop in the last week of October, as at that time I generally finish soiling my horses with lucern, and now solely depend upon my carrots, with a proper allowance of hay, as winter food for my horses, until about the first week of June following, when the lucern is again ready for soiling. By reducing this practice to a system, I have been enabled to feed ten cart horses throughout the winter months for these last six years, without giving them any corn whatever, and have at the same time effected a considerable saving of hay, from what I found necessary to give to the same number of horses, when according to the usual custom of the country, I fed my horses with corn and hay. I give them to my cart-horses in the proportion of seventy pound weight of carrots a horse per day, upon an average, not allowing them quite so many in the very short days, and sometimes more than that quantity in the spring months, or to the amount of what I withheld in the short winter days. The men who tend the horses, slice some of the carrots in the cut chaff or hay, and barn-door refuse; the rest of the carrots they give whole to the horses at night, with a small quantity of hay in their racks; and with this food my horses generally enjoy uninterrupted health. I mention this, as I believe that some persons think that carrots *only*, given as food to horses, are injurious to their constitutions; but most of the prejudices of mankind have no better foundation, and are taken up at random, or inherited from their grandfathers. So successful have I been with carrots as a winter food for horses, that with the assistance of lucern for soiling in summer, I have been enabled to prove by experiments conducted under my own personal inspection, that an able Norfolk team-horse, fully worked two journeys a day, winter and summer, may be kept the entire year round upon the produce of only one statute acre of land. I have likewise applied carrots with great profit to the feeding of hogs in winter, and by that means have made my straw into a most excellent manure, without the aid of neat cattle; the hogs so fed are sold on Norwich hill to the London dealers as porkers." The profit of carrots so applied, he shews in a subsequent statement, together with an experiment of feeding four Galloway bullocks with carrots, against four others fed in the common way with turnips and hay. (*Communications*, &c.)

4947. *In comparing the carrot with the potatoe*, an additional circumstance greatly in favor of the former is, that it does not require to be steamed or boiled, and it is not more difficult to wash than the potatoe. These and other circumstances considered, it appears to be the most valuable of all roots for working horses.

4948. *The use of the carrot in domestic economy* is well known. Their produce of nutritive matter, as ascertained by Sir H. Davy, is ninety-eight parts in one thousand, of which three are starch, and ninety-five sugar. They are used in the dairy in winter and spring to give color and flavor to butter. In the distillery, owing to the great proportion of sugar in their composition, they yield more spirit than the potatoe: the usual quantity is twelve gallons per ton. They are excellent in soups, stews, and haricots, and boiled whole with salt beef.

4949. *To save carrot seed*, select annually some of the most perfect and best-shaped roots in the taking-up season, and either preserve them in sand in a cellar till spring, or plant them immediately in an open airy part of the garden, protecting them with litter during severe frosts, or earthing them over, and uncovering them in March following. The seed is in no danger of being contaminated by any other plant, as the wild carrot, even should it happen to grow in the neighborhood, flowers later. In August it will be fit to gather, and is best preserved till wanted on the stalks. This is the most certain mode of procuring genuine and new seed, but still it will be found advisable to change it occasionally.

4950. *The diseases of carrots* are only such as are common to most plants, such as mildew, insects, &c. The mildew and worms at the root frequently injure crops, and are to be guarded against as far as practicable by a proper choice of soil, season of sowing, and after culture.

SECT. IV. *The Parsnep.* — *Pastinaca sativa*, L. *Pentan. Dig. L.* and *Umbelliferæ*, J. *Le Panais*, Fr.; *Pastinake*, Ger.; and *Pastinaca*, Ital.

4951. *The parsnep* is a biennial plant with a fusiform root like the carrot, and nearly equal in its products of nutritive and saccharine matter. It is a native of most parts of Europe and generally cultivated in gardens, but is only of late and very partial introduction as a field plant. Its culture has been chiefly confined to the island of Jersey, where it attains a large size, and is much esteemed for fattening cattle and pigs. It is considered rather more hardy than the carrot, and its produce is said to be greater. It may be sown either in autumn or spring, and its seed admits of drilling by machinery. The plants when they come up are more easily recognized than carrots, and therefore their culture is on the whole more simple, less dependant on manual labor, and, therefore, more suited to farming. For the rest, their culture is the same as that of the carrot.

4952. *The variety best suited for the field* is the large Jersey, the seed of which should be procured from the island, as that of the garden parsnep sold by the seedsmen never attains the same size.

4953. *The soil, preparation, and manure* for this plant are the same as for the carrot.

4954. *The quantity of seed for sowing in drills* is from 4 to 5 lbs. per acre, and for broad-cast 6 or 8 lbs. It must always be new, as two years seed does not come up freely. It may or may not be prepared by steeping, but it requires no earth or sand, or rubbing, as it passes freely through the same drill that will sow tares or pease.

4955. *The time of sowing* is generally about the middle of February; but some sow in September, in which case the seed does not vegetate till early in spring. This last method, however, is obviously against the culture of the soil, which must thus remain a year in a consolidated state.

4956. *The manner of sowing* is generally in drills at fifteen or eighteen inches distance: but some sow broad-cast and harrow in the seed; and in Jersey parsneps and beans are generally cultivated together. The beans are first dibbled in, and afterwards the parsnep seed scattered over the surface and harrowed. It is acknowledged that a good crop of both plants is never obtained; and therefore, though this mode may be found to answer in the mild climate of Jersey, it is not to be imitated in other places. Drills or broad-cast without any intermixture of plants are the only advisable modes.

4957. *The after-culture and taking up* is the same as for the carrot, with this difference, that the parsnep when sown broad-cast is generally thinned out to twelve inches at an average plant from plant, and when in rows eighteen inches apart, to nine inches in the row.

4958. *The produce* is said to be greater than that of carrots; and the economical application the same. In the fattening of cattle it is found equal if not superior, performing the business with as much expedition, and affording meat of exquisite flavor and a highly juicy quality. The animals eat it with much greediness. It is reckoned that thirty perches, where the crop is good, will be sufficient to fatten an ox of three or four years old when perfectly lean, in the course of three months. They are given in the proportion of about thirty pound weight morning, noon, and night; the large ones being split in

three or four pieces, and a little hay supplied in the intervals of those periods. And, when given to milch-cows with a little hay in the winter season, the butter is found to be of as fine a color and as excellent a flavor as when feeding in the best pastures. Indeed, the result of experiment has shewn, that not only in neat cattle, but in the fattening of hogs and poultry, the animals become fat much sooner, and are more bulky, than when fed with any other root or vegetable. And that, besides, the meat is more sweet and delicate.

4959. *Parsnep leaves* being more bulky than those of carrots may be mown off before taking up the roots, and given to cows, oxen, or horses, by whom they will be greedily eaten.

4960. *The use of the parsnep in domestic economy* is nearly the same as that of the carrot. They are much esteemed to salt fish, and are sometimes roasted for that purpose. Their produce in nutritive matter is 99 parts in 1000, of which 9 are mucilage, and 90 sugar. Gerarde says, that a very good bread was made from them in his time. They afford as much spirit as the carrot, and make an excellent wine.

4961. *To save parsnep seed*, proceed as with the carrot. The parsnep being more hardy and luxuriant than the carrot, is less liable to the mildew and worms, but equally so to become forked if the soil be not deep and well pulverized, and the manure minutely divided and equally distributed.

SECT. V. *The Field-Beet.*—Beta, L. Pentan. Dig. L. and Chenopodeæ, J. Betterave, Fr.; Mangold-würzel, Ger.; and Biettole, Ital.

4962. *The field-beet*, commonly called the mangold-würzel, and sometimes erroneously the root of scarcity (in German *mangel würzel*), is supposed by Professor Thaer to be a mongrel between the red and white beet. It has a much larger bulb than either, and that bulb, in some varieties, grows in great part above ground. It has been a good deal cultivated in Germany and Switzerland, both for its leaves and roots; the leaves are either used as spinach or given to cattle; and the roots are either given to cattle, used in distillation, or for extracting sugar. The culture of the field-beet in Britain is very recent, and it may be questioned whether it has any advantages over the turnip for general agricultural purposes. It admits, however, of being cultivated on ridgelets and with as little manual labor as the turnip, while it will prosper on a stronger soil, and near large towns it is not liable to the depredations usually committed on turnips or carrots, as the root is unpalatable either raw or boiled.

4963. *The variety preferred in Germany* is one slightly tinged with red for cattle, and the pale-yellow variety for the distillery and sugar manufacture. The seed must not exceed a year old, and great care should be taken that the seed of the common red and white beet are not mixed with it. The seed of every variety of beet is very apt to degenerate.

4964. *Any soil* will suit this plant provided it be rich; immense crops have been raised on strong clays; but such soils are not easily prepared for this sort of crop, and are also ill adapted for after-culture. The preparation should be exactly the same as for turnips; and the seed should be sown on the ridgelets in the same manner. Some, however, dibble in the seed in order to save the expense of thinning. The season of sowing is the same as for the parsnep, and should not be deferred later than the middle of April. The after-culture consists in horse-hoeing, hand-hoeing, and weeding, as in the culture of the turnip, and the plants are thinned out to about the same distance in the rows. Blanks may be filled up by transplanting, or, as in the case of the Swedish turnip, whole crops may be reared in this way; but the produce is never so large. As the transplanting, however, takes place in May, more time is afforded, and drier weather obtained for cleaning the soil. The plants are set by the dibbler along the centre of the ridgelets, which are previously consolidated by rolling.

4965. *The produce is, ceteribus paribus*, about the same as that of the Swedish turnip, but the nutritive matter afforded by the beet is 136 parts in 1000, of which 13 are mucilage, 119 sugar, and 4 gluten. According to Von Thaer, they afford 10 per cent. of nutritive matter, and are in that respect to hay as 10 to 46, and to potatoes as 20 to 46. An acre would thus appear to afford more nourishment than either turnips, carrots, or parsneps.

4966. *The application of the field-beet* is almost entirely to the fattening of stock, and feeding of milch-cows. Near London they are in repute for the latter purpose; and, according to Von Thaer, they cause a great increase of milk, as well as improve its flavor. The tops are first taken off, and given by themselves, and then the roots are taken up, washed, and given raw. The roots are much more easily injured by frost than the turnip, carrot, or parsnep, and are stored with difficulty. The leaves make a very good spinach, but the roots cannot be used in cooking like those of the red beet. In the distillery it is nearly half as productive as the potatoe; but, according to Von Thaer, it is not likely to yield much profit in the manufacture of sugar.

1967. *To save seed*, select the finest specimens, preserve them in sand during winter, and plant them in an airy part of the garden in March. The rest is easy.

1968. *To diseases* no plant is less liable than the beet.

SECT. VI. *The Cabbage Tribe.* — *Brassica*, L. *Tetrad. Siliq.* L. and *Crucifera*. J. *Chou*, Fr. ; *Kohl*, Ger. ; and *Cavolo*, Ital.

1969. *The cabbage tribe* are of the greatest antiquity in gardens, and most of them may be cultivated in the fields with success. For the common purposes of farming, however, there can be little doubt that they will afford less profit than any of the plants hitherto treated of in this chapter ; but near large towns or sea-ports, they may answer the purpose of the farm-gardener. Cabbage culture, Brown observes, is much more hazardous, far less profitable, and attended with infinitely more trouble than that of turnips, while the advantages to be derived from them are not, in our opinion, of a description to compensate the extra hazard and trouble thereby incurred.

1970. *The culture of cabbage* has been strongly recommended by several speculative agriculturists, and examples adduced of extraordinary produce and profits ; but any plant treated in an extraordinary manner will give extraordinary results ; and thus an inferior production may be made to appear more valuable than it really is. One reason why so much has been said in their favor by Arthur Young and other southern farmers, is, that they compare them with the produce of turnips, which, in the south of England, is averaged at only 15 tons per acre.

1971. *The variety of cabbage* cultivated in the fields for cattle, is almost exclusively the large field cabbage, called also the Scotch, Strasburg, drumhead, &c. For the purposes of domestic economy, other varieties of early and late cabbage, as the York, Battersea, sugar-loaf, imperial, &c. are grown, and also German greens, Savoy cabbage, and even Brussels sprouts and brocoli. The Kohl riibe, or turnip-cabbage, has also been tried, but it is not fit to use in British cookery, and in respect to its properties in any other respect, it has not one to recommend it.

1972. *Any soil that is rich* will suit the cabbage, but a strong loam is preferred. The best mode of preparation for field cabbage is that for potatoes or turnips, the plants being dibbled along the centre of each ridgelet. For early cabbage no ridgelets are required, as the plants are inserted in rows, by a line at much narrower distances.

1973. *The season for planting* for a full crop of field cabbages, is usually March ; but cabbages may be planted as late as June, and produce a tolerable crop by November ; and in this way they may sometimes be made to succeed an unsuccessful sowing of turnips. The plants used in March should be the produce of seed sown in an open loamy part of the garden in the preceding August ; but those planted in May or June may be the produce of seed sown in the February or March of the same year.

1974. *The preparation* given to the plants consists in pinching off the extremity of their tap-root, and any tubercles which appear on the root or stem, and in immersing the root and stem in a puddle, or mixture of earth and water, to protect the fibres and pores of the roots and stem from the drought. The plants may then be inserted by the dibber, taking care not to plant them too deep, and to press the earth firmly to the lower extremity of the root. If this last point is not attended to in planting by the dibber, the plants will either die, or, if kept alive by the moisture of the soil or rain, their progress will be very slow. When the distance between the ridgelets is twenty-seven inches, the plants are set about two feet asunder in the rows, and the quantity required for an acre is about 6000 plants. Some recommend sowing as for turnips ; but by this mode one of the advantages of a green crop is infringed on : viz. the time given to clean the land. Where cabbages are sown, that operation must be performed at least a month sooner than if they were planted ; consequently, the best month of the cleaning season is lost. To plant or sow a green crop on land in good heart, that does not require cleaning, will seldom be found good husbandry. It may succeed near large towns, where roots and other green produce sells high, but it can never enter into any general system of farming.

1975. *The after-culture* consists in horse and hand-hoeing and weeding ; and the crop is taken by chopping off the heads with the spade, leaving an inch or two of stalk to each. They may be preserved by housing, but only for a short time. The produce is said to be from 35 to 40 tons per acre. Sir H. Davy found that 1000 parts of cabbage gave 73 of nutritive matter, of which 41 are mucilage, 24 saccharine matter, and 8 gluten.

1976. *The application of the field cabbage* is generally to the feeding of milch-cows, and sometimes to the fattening of oxen and sheep. For the former purpose great care must be taken to remove the outside decaying leaves, otherwise they are apt to give an unpleasant flavor to the milk and butter. Cabbages are also eaten by swine and horses, and are reckoned excellent food for sheep that have newly-dropped their lambs, and for calves. A cow will eat from 100 to 150 lbs. of cabbage per day, and a sheep ten or twelve pounds, besides a moderate allowance of hay. Early or garden cabbages are sold

to green-grocers, or to the consumers, or to ship's victuallers for the purpose of being pickled or made into sour crout.

4977. *To save cabbage seed* select a few fine specimens and plant them by themselves, and where they will be in no danger of being contaminated by others of the Brassica tribe when in flower. The seed will keep many years.

4978. *The diseases of cabbages* are the same as those of the turnip, with the exception of the forked excrescence. On the roots of the plants are frequently found knobs, which, in the preparation for transplanting, should, as we have already observed, be carefully removed.

SECT VII. *Of some other Plants which might be cultivated in the Fields for their Roots or Leaves.*

4979. *Every hardy garden plant* may be cultivated in the fields, and with very little manual labor. Accordingly we find onions, spinach, cress, radishes, and even cucumbers grown by farmers, or farm gardeners in the neighborhood of the metropolis, and also in other places. None of these plants, however, can be considered as belonging to agriculture, nor should we notice those which follow, but because they have been tried and recommended by zealous cultivators, and are treated of in some works on farming. No plant can be considered as belonging to agriculture that is not in sufficient demand, or of sufficient general use in feeding stock, as to admit of its frequent occurrence in rotations, and such certainly cannot be said to be the case with the Jerusalem artichoke and lettuce, now about to be noticed.

4980. *The Jerusalem artichoke* (*Helianthus tuberosus*, L.) is a tuberous-rooted plant with leafy stems from four to six feet high. It thrives well on soft moist soils, and even it is said on moist peat soils, and it is alleged that its tops will afford as much or more fodder per acre than a crop of oats, and its roots half as many tubers as an ordinary crop of potatoes. (*Agricultural Magazine*, 1807-8.) The soil may be cultivated in all respects like the potatoe. The tubers being abundant in the market gardens, are to be had at little more than the price of potatoes.

4981. *The common coss lettuce* (*Lactuca sativa*, L.) has been grown for feeding pigs and other purposes. Arthur Young informs us, in his *Calendar of Husbandry*, that he first observed the sowing of lettuces for hogs practised in a pretty regular system, on the farm of a very intelligent cultivator (not at all a whimsical man) in Sussex. He had every year an acre or two, which afforded a great quantity of very valuable food for his sows and pigs. He adds, that it yields milk amply, and all sorts of swine are very fond of it. And he thinks, that the economical farmer, who keeps many hogs, should take care to have a succession of crops for these animals, that his carts may not be for ever on the road for purchased grains, or his granary opened for corn oftener than is necessary. To raise this sort of crop, the land should have been ploughed before the winter frosts, turning in by that earth twenty loads of rich dung per acre, and making the ridges of the right breadth to suit the drill-machine and horse-hoe, so that in the month of March nothing more may be necessary than to scarify the land, and to drill the seed at one foot equi-distant, at the rate of four pounds of seed per acre. Where the stock of swine is large, it is proper to drill half an acre or an acre of lettuce in April, the land having been well manured and ploughed as directed above, being also scuffed in February and March, and well harrowed, repeating it before drilling. And at this period the crop which was drilled in March (a succession being essentially necessary) should be thinned in the rows by hand, to about nine or ten inches asunder. If this necessary attention be neglected, the plants, he says, draw themselves up weak and poor, and will not recover it. Women do this business as well as men. When about six inches high, they should be horse-hoed with a scarifier or scuffler, having the hoe about four inches, or at most five inches in width. With this sort of green food some kind of meal, or other dry meat, should be combined, as without it, it is apt to prove very laxative, &c. — This Sussex cultivator is not likely to be followed by any rent-paying farmer, who can grow any of the clovers, turnips, or potatoes. The quotation affords a good specimen of Arthur Young's mode of writing on agricultural subjects.

CHAP. V.

Of the Culture of Herbage Plants.

4982. *The cultivation of clovers and other herbage plants* used exclusively as food for live stock, is comparatively a modern improvement. They were known, as we have seen, to the Greeks and Romans, and cultivated from a very early period in the Low Countries; but do not appear to have attracted much notice in Britain till the sixteenth century, when our frequent intercourse with Holland led to the introduction of some of our best field plants and agricultural practices. At present clovers enter largely into the succession of crops, on all soils, and in every productive course of management. Before they were introduced into cultivation, when land was exhausted by grain crops, it was necessary to leave it in a state of comparative sterility for several years, before it was either valuable as pasture, or again fit for carrying corn. But at present, clovers are not only indispensable in the cultivation of white and green crops alternately, upon very rich soils, but are the foundation of convertible husbandry on land that is not so rich as to permit of a constant aration, and which therefore requires two or more years' pasturage at certain intervals. Lucern and saintfoin, though of much less value as general crops, are valuable plants

in particular situations ; more especially the latter, which will produce good crops on dry chalky and limestone soils, when most other agricultural plants and even grasses would barely maintain their existence.

4983. *The characteristic points of culture* of this class of plants are broad-cast sowing, mowing, soiling, and hay-making, and that when cut for the two last purposes, two or more crops may be had in a season from the same roots.

4984. *The nutritive products* of the principal herbage plants are thus given by Sir H. Davy :

Systematic name.	The quantity analysed, of each sort 1000 parts.	Whole quantity of soluble or nutritive matter.	Mucilage or starch.	Saccharine matter or sugar.	Gluten or albumen.	Extract, or matter rendered insoluble during evaporation.
<i>Trifolium pratense</i> -	Red clover -	39	31	3	2	3
medium -	Cow grass -	39	30	4	3	2
repens -	White clover -	32	29	1	3	5
<i>Hedysarum onobrychis</i> -	Saintfoin -	39	28	2	3	6
<i>Medicago medic</i> -	Lucern -	23	18	1	—	4

SECT. I. The Clover Family.—*Trifolium*, L. *Diadel.* Decan. L. and *Leguminosæ*, J. Tréfle, Fr. ; *Klee*, Ger. ; and *Trifoglio*, Ital.

4985. *The clovers* (fig. 568.) are a numerous family, chiefly natives of Europe : those selected by the agriculturist are natives of Britain ; and one species, the white or



creeping clover, is often found in great luxuriance in native pastures. As rye-grass is very generally sown with clovers, it will be necessary to treat of its culture in connection with these plants, reserving, however, the more particular consideration of rye-grass till we treat of the hay grasses. (Chap. VI.) Many intelligent cultivators consider rye-grass as a very severe crop for the soil ; and it is alleged that wheat does not succeed well after the herbage with which rye-grass is intermixed in any considerable quantity. Other plants have accordingly been recommended as a substitute for rye-grass, and cock's-foot (*Dactylis glomerata*) has been tried, apparently with great success, by Coke, of Holkham in Norfolk, and others. But this is a very coarse grass when allowed to rise to any height, and the use of it for hay has not yet been ascertained. Donaldson considers the general introduction of clovers, and the cultivated grasses, as one of the greatest improvements in modern husbandry. The commencement of improvements in the different species of live-stock, in the modes of cultivation, and in the superior quality, as well as quantity, of the crops of grain, may all, he thinks, be dated from the period when the sowing of clovers and grass-seeds was first introduced into the different districts of the kingdom.

4986. *The species of clover* in cultivation are the red clover, (*Trifolium pratense*, a), a biennial, and sometimes, especially on chalky soils, a triennial plant, known from the other species by its broad leaves, luxuriant growth, and reddish purple flowers.

4987. *The white, or creeping, or Dutch clover*, (*T. repens*, b), a perennial plant, known by its creeping stems and white flowers.

4988. *The yellow clover, hop-trefoil, or shamrock clover*, (*T. procumbens*, c), a biennial, known by its procumbent shoots, yellow flowers, and black seeds.

4989. *The cow-grass, meadow clover, or marl-grass*, (*T. medium*, d) a perennial, resembling the red clover, but of a paler hue, dwarfer habit, with pale red or whitish flowers, and long roots very sweet to the taste.

4990. *Trifolium incarnatum*, an annual and native of Italy, has been recommended by an Italian professor to Sir John Sinclair (*Farm. Jour. Aug. 1821*); but it is not likely that such a plant, which even as an annual in our garden borders has not a fourth of the vigor of the common clover, should ever be worth culture in this country.

4991. *In the choice of sorts* the red or broad clover is the kind most generally cultivated on land that carries white and green crops alternately, as it yields the largest produce for one crop of all the other sorts. White and yellow clover are seldom sown with it, unless when several years pasturage is intended.

4992. *The soil* best adapted for clover is a deep sandy loam, which is favorable to its long tap-roots: but it will grow in any soil, provided it be dry. So congenial is calcareous matter to clovers, that the mere strewing of lime on some soils will call into action clover-seeds, which it would appear have lain dormant for ages. At least this appears the most obvious way of accounting for the well-known appearance of white clover in such cases.

4993. *The climate* most suitable for the clovers, as of most plants, natives of Europe, is one neither very hot nor very dry and cold. Most leguminous plants delight both in a dry soil and climate, and warm temperature, and the clover will be found to produce most seed under such circumstances; but as the production of seed is only in some situations an object of the farmer's attention, a season rather moist, provided it be warm, is always attended by the most bulky crops of clover herbage.

4994. *The preparation of the soil and manures*, which clover receives in ordinary farm culture, are those destined also for another crop; clover mixed with a certain proportion of rye-grass being generally sown along with or among corn crops, and especially with spring sown wheat, barley, and the early varieties of oats. Unless, however, the soil on which these crops are sown are well pulverized, and have been some years under tillage, clovers will not succeed in them, it being ascertained that newly-broken-up leys or pasture grounds cannot be sown down or restored to clover and grasses, till the soil is thoroughly comminuted, and the roots of the former grasses and herbage plants completely destroyed.

4995. *The time of sowing* clover-seeds is generally the spring, during the corn-seed time, or from February to May; but they may also be sown from August to October, and when they are sown by themselves, that is, unaccompanied by any corn crop, this will be found the best season, as the young plants are less liable to be dried up and impeded in their progress by the sun, than when sown alone in spring, and remaining tender and unshaded during the hot and dry weather of July.

4996. *Some prepare the seed* for sowing by steeping in water or in oil, as in Switzerland, and then mixing it with powdered gypsum, as a preventive to the attacks of insects.

4997. *The manner of sowing* is almost always broad-cast. When sown with spring corn, clover and grass-seeds are usually put in immediately after the land has been pulverized by harrowing in the corn-seed, and are themselves covered by one course more of the harrows; or, if the corn is drilled, the small seeds are sown immediately before or after hand-boeing; and the land is then finished by a course of the harrows. A lighter harrow is generally employed in covering such seeds, than that used for corn. When the land is under an autumn sown crop of wheat or other grain, though the clovers and rye-grass are still sown in spring, the proper period must depend both upon the state of the land, and the progress of the crops; and it may be often advisable to break the crust formed on the surface of tenacious soils, by using the harrow before the clovers are sown, as well as afterwards to cover them. Sometimes the roller only is employed at this time, and there are instances of clover and rye-grass succeeding when sown, without either harrowing or rolling. But it is commonly of advantage to the wheat crop itself, to use the harrows in spring, and the roller alone cannot be depended on, unless the season be very favorable. In some cases grass-seeds are sown by themselves, either in autumn or spring, but rarely on tillage land. Nature has not determined any precise depth for the seed of red clover more than of other seed. It will grow vigorously from two inches deep, and it will grow when barely covered. Half an inch may be reckoned the most advantageous position in clay soil; a whole inch in what is light or loose. It is a vulgar error, that small seed ought to be sparingly covered. Misled by that error, farmers commonly cover their clover seed with a bushy branch of thorn; which not only covers it unequally, but leaves part on the surface to wither in the air.

4998. *In the operation of sowing* some consider it best to sow the clover and rye-grass separately, alleging that the weight of the one seed and lightness of the other, are unfavorable to an equal distribution of both.

4999. *The quantity of seed* sown on an acre is exceedingly various; not only according as more or less white or yellow clover is sown along with grass-seeds and red clover, or when pasturage is intended, but, even when they are the only kinds sown, the quantity is varied

by the quality of the soils, and the different purposes of hay, soiling, or one year's pasture, to which the crop is to be applied. When pasture is the object, more seed ought to be allowed than is necessary, when the crop is to be cut green for soiling; and for hay, less may suffice than for either of the former. Finely pulverized soils do not require so much seed as clays, on which clover and rye-grass are very frequently sown among autumn or winter-sown wheat, when there is more danger of a part of it perishing from being imperfectly covered. In general, eight or ten pounds may be taken as the *minimum* quantity, though there have been instances of good crops from less; and from that to fourteen pounds or more per English statute acre. Rye-grass, commonly at the rate of a bushel per acre, but in many cases only half, or two-thirds of a bushel, is mixed with this weight of clover, and both are sown at the same time. The rye-grass may be either of the perennial or annual variety, as it is understood that the herbage is to be continued for only one year; and the annual is sometimes sown in preference, as producing a bulkier crop than the perennial.

5000. *When it is intended to retain the land in pasture for several years, the quantity of red clover is diminished, and several kinds of more permanent herbage are added, the most common of which are white and yellow clover, and ribwort. No general rule can be laid down as to the proper quantity of each of these kinds; in some cases red and white clover are sown in equal proportions, and in others the latter is made greatly to predominate. The yellow clover and ribwort are not often sown at the rate of more than two or three pounds per acre. It is scarcely necessary to add, that, in this case, the rye-grass should always be of the perennial sort.*

5001. *In the selection of clover and rye-grass seeds particular attention should be paid to their quality and cleanness; the purple color of the clover seed denotes that it has been ripe and well saved; and the seeds of weeds may be detected in it by narrow inspection, if there be any; but various noxious weeds are frequently mixed up with the seeds of the rye-grass, which it is difficult either to discover or to separate from them. Between the seeds of the annual and perennial rye grass, the difference is hardly discernible; and therefore, unless it is of his own growth, the cultivator must depend in a great measure on the character of the person from whom he purchases it. Red clover from Holland or France, has been found to die out in the season immediately after it has been cut or pastured; while the English seed produces plants, which stand over the second, many of them the third year (*General Report of Scotland*, vol. i. p. 537.); thus remaining in the latter case four summers in the ground from the time of sowing.*

5002. *The after-culture of clover and rye grass consists chiefly of picking off any stones or other hard bodies which may appear on the surface in the spring succeeding that in which it was sown, and cutting out by the roots any thistles, docks, or other large grown weeds. After this the surface should be rolled once to smooth it for the scythe. This operation is best performed in the first dry weather of March. Some give a top-dressing of soot, gypsum, common lime, peat, or wood-ashes at this time or earlier; Gypsum has been particularly recommended as a top dressing for clovers, and the other herbage legumes, because as their ashes afford that substance in considerable quantities, it appears to be a necessary ingredient of their food.' Dutch ashes (420.) have been strongly recommended as a top-dressing for red clover, and they also contain gypsum; but where the soil is in good heart, and contains calcareous matter, any description of top-dressing, though it may be of advantage when it does not interfere with the general economy of the farm, cannot be considered as necessary. (*Sup. E. Brit. art. Agr.*)*

5003. *The taking of the clover, or clover and rye-grass crop, is either by cutting green for soiling, by making into hay, or by pasturing. It is observed in The Code of Agriculture, that it is a most important point to ascertain, in what cases cutting, or feeding, is most beneficial. If fed, the land has the advantage of the dung and urine of the pasturing stock; but the dung being dropt in irregular quantities, and in the heat of summer, when it is devoured by insects, loses much of its utility. If the dung arising from the herbage, whether consumed in soiling, or as hay, were applied to the land, in one body, and at the proper season, the operation would be more effectual. The smother of a thick crop, continued for any time upon the ground, greatly tends to promote its fertility; and it has been pretty uniformly found, after repeated trials, upon soils of almost every description, that oats taken after clover that has been cut, either for soiling or hay, is superior to the crop taken after clover pastured by sheep.*

5004. *Soiling is a term applied to the practice of cutting herbage crops green for feeding or fattening live stock. On all farms, under correct management, a part of this crop is cut green, for the working horses, often for milk cows, and, in some instances, both for growing and fattening cattle. There can be no doubt of the advantages of this practice, in regard to horses and cows; but for young, and for fattening beasts, a sufficient number of experiments are not known to have been yet made with any great degree of accuracy. Young animals require exercise in the open air, and, probably, will not be found to thrive so well in houses or fold-yards, during summer, as on pastures; and though in every*

case there is a great saving of food, the long, woody, and comparatively naked stems of the plants, with leaves always more or less withered, are perhaps not so valuable in the production of beef on fattening stock, as a much smaller weight of herbage taken in by pasturage. Milk-cows, however, are so impatient of heat and insects, that this way of feeding them, at least for a part of the day, in warm weather, ought to be more generally adopted; and the convenience of having working horses always at hand, besides that they fill their stomachs speedily, is of not less importance than economy. (See *Communications to the Board of Agriculture*, vol. vii. *Brown's Treatise on Rural Affairs*, vol. ii. *General Report of Scotland*, vol. ii. and iii.)

5005. *In feeding cattle with green clover*, attention must be paid to prevent swelling, or hoving, which is very apt to take place when they are first put on this food, especially if it be wet with rain or dew; and cattle are exposed to this danger, whether they are sent to depasture the clover, or have it cut and brought home to them; though, if the plants be somewhat luxuriant, the danger is greater in the former case. After being accustomed to this rich food for a few days, during which it should be given rather sparingly, the danger is much diminished; but it is never safe to allow milch cows, in particular, to eat large quantities of wet clover.

5006. *The making herbage plants into hay* is a process somewhat different from that of making hay from natural grasses. All the herbage tribe ought to be mown before the seed is formed, and indeed before the plants have fully blossomed, that the full juice and nourishment of the herb may be retained in the hay. By the adoption of this system, the hay is cut in a better season, it can be more easily secured, and it is much more valuable. Nor is the strength of the plant lodged in the seed, which is often lost. The great advantage of converting under-ripe herbage and grass into hay is now beginning to be known. There is much more saccharine matter in it, and it is consequently greatly more nutritious. A crop of clover or saintfoin, when cut in the early part of the season, may be ten per cent. lighter than when it is fully ripe; but the loss is amply counterbalanced, by obtaining an earlier, a more valuable, and more nutritious article; while the next crop will proportionably be more heavy. The hay from old herbage will carry on stock, but it is only hay from young herbage that will fatten them. When the stems of clover become hard and sapless, by being allowed to bring their seeds towards maturity, they are of little more value as provender, than an equal quantity of the finer sort of straw of corn.

5007. *The mode of making clover-hay*, and that of all herbage plants, as practised by the best farmers, is as follows. The herbage is cut as close to the ground and in as uniform and perfect a manner as it is possible to accomplish, by the scythe kept constantly sharp. The surface having been in the preceding spring freed from stones and well rolled, the stubble after the mower ought to be as short and smooth as a well shaven grass lawn. What part of the stems is left by the scythe, is not only lost, but the after-growth is neither so vigorous nor so weighty, as when the first cutting is taken as low as possible.

5008. *As soon as the swath or row of cut herbage is thoroughly dry above*, it is gently turned over (not tedded or scattered), without breaking it. Sometimes this is done by the hand, or by a small fork; and some farmers are so anxious to prevent the swath from being broken, that they will not permit the use of the rake shaft. The grass, when turned over, in the morning of a dry day, is put into cocks in the afternoon. The mode of performing this is very simple and expeditious; and none but women, boys, and girls, under the eye of a confidential servant, are usually employed. If the crop is heavy, a row of cocks is placed in the middle ridge of three, and if light of five ridges. A distinct company of carriers and rakers is allotted to every such number of ridges; and the separate companies proceed each on its own ground, and in the same manner as in reaping grain, which occasions a degree of competition among them for despatch, clean raking, and neat well-built cocks. The carriers gather the hay, and carry it to the ridge where the cock is to be built, by one of the most experienced hands. A raker follows the carrier, taking up and bringing to the cocks the remains of the swath. There may be, in general, about five people employed about each row of cocks; a carrier and raker on each side of the ridge on which the cocks are placed, and a person on the ridge, who builds them. But when the crop is not weighty, more rakers are required, as a greater space must be gone over.

5009. *As the cocks are thus placed in a line*, it is easy to put two or more into one afterwards; and the larger cocks may be speedily drawn together, to be put into tramp-ricks, by means of ropes thrown round their bottoms, and dragged along by a horse. It is impossible to lay down any rules for the management of hay, after it is put into cocks; one thing is, however, always attended to, not to shake out, scatter, or expose the hay oftener than is necessary for its preservation. Sometimes the cocks have been put up so large, that they never require to go to a tramp-rick, but were carted to the stack-yard, without ever being broken, and put up in alternate layers with old hay. But where this is attempted, there must not be much clover. The practice of mixing the new with the old hay is, however, a good one, and saves a great deal of time and labor, at the same time that the old hay is much improved by the mixture.

5010. The best managers disapprove of *spreading out the swaths of clover and rye-grass*, though this is often necessary with natural grasses, which are cut and harvested later in the season. The more the swath is kept unbroken, the hay is greener, and the more fragrant.

5011. *Another mode of hay-making*, said to have been originally practised in Lancashire, has been found to answer well in the moist atmosphere of the west of Scotland. This is called tipping or rippling; and if the grass be dry, the operation begins as soon as it is mown. "In making a tippie, a person with his right-hand, rolls the swath inwards, until he has a little bundle; then the same is done by the left, until both meet, and form eight to twelve pounds, or nearly so. This bundle is then set up against the legs, or between the feet; a rope is twisted of the grass, while the bundle is supported in this manner, and tied round it near its top; and from the top are drawn up a few straggling stems, which are twisted to make the tippie taper to a point, and give it as much a conical shape as possible. If the crop is strong, there is a row of tippies placed on each swath; if light, two of these are put into one row. After standing a few hours, they become so smooth on the outside, that the heaviest rains seldom wet them through; and when

wet, they are soon dried again in good weather. As soon as ready, they are put into the summer-rick, or, if very dry, even the winter-stack, but are never opened out or tedded, to make them dry, as they never require it. By this method, not a blade is lost, and the hay is nearly as green as a leaf dried in a book. In a moderate crop, one woman will tipple to one mower, and a woman will rake to two tipplers, or two swathers. But where the crop is strong, it may require three women to keep pace with two mowers. After the hay is put up in this manner, the crop may be considered as secure, though it may continue wet weather for a considerable length of time." (*General Report of Scotland*, vol. ii. p. 11.)

5012. Hay is stacked in circular or oblong stacks, the latter form being most generally approved of, and carefully thatched, as has been already observed in regard to corn. It is never advisable to allow this kind of hay to become heated in any considerable degree, in the stack, though a slight exudation, with a very gentle warmth, is usually perceptible, both in the field-ricks and in the stacks, for a few days after they are built. But this is a quite different thing from that intentional heating, carried so far, in many instances, as to terminate in conflagration.

5013. *The after-growth or second crop of clover* is vigorous or weak, according to the proportion of clover plants to rye-grass, to the time when the first crop was cut, and to the moisture and warmth of the season. When the first cutting has been made early for soiling, there will sometimes be three cuttings in one season. The first of these after-cuttings may be made into hay, and sometimes the second; but in general, both are consumed by soiling or pasturing, unless in some dry warm districts, as Norfolk, and parts of Suffolk, Kent, &c., when the second growth is left to ripen its seed. In the northern counties the second crop is seldom made into hay, owing to the difficulty of getting it thoroughly dried at a late period of summer, when other more urgent operations usually employ all the laborers of a farm. If it be cut for this purpose, the best method of saving it, is to mix it up with straw, which will absorb a part of its juices. It is often cut green, as a part of the soiling system; or, where a sheep stock is kept, pastured by the old ewes, or other sorts, that are to be fattened the ensuing winter on turnips.

5014. *In consuming clover and other herbage plants by pasturing or eating down on the spot*, three methods have been adopted, tethering, hurdling, and free pasturage.

5015. *Tethering* may be considered a rude practice, and is chiefly confined to the north of Scotland and Ireland. In *The Agricultural Report of Aberdeenshire*, it is stated, that there are some cases, where the plan of tethering can be practised with more profit than even soiling. In the neighborhood of Peterhead, for instance, they tether milch-cows on their grass fields, in a regular and systematic method; moving each tether forward in a straight line, not above one foot at a time, so as to prevent the cows from treading on the grass that is to be eaten; care being always taken, to move the tether forward, like a person cutting clover with a scythe, from one end of the field to the other. In this way, a greater number of cows can be kept, on the same quantity of grass, than by any other plan; except where it grows high enough to be cut, and given them green in houses. In one instance, the system was carried to great perfection, by a gentleman who kept a few sheep upon longer tethers, following the cows. Sometimes also, he tethered horses afterwards upon the same field, which prevented any possible waste, for the tufts of grass produced by the dung of one species of animal, will be eaten by those of another kind, without reluctance. This system was peculiarly calculated for the cow-feeders in Peterhead; as, from the smallness of their holdings, they could not afford to keep servants to cut, or horses to carry home the grass to their houses, to be consumed in a green state. (*Code*.)

5016. *In hurdling off clovers or herbage crops*, a portion of the field is enclosed by hurdles, in which sheep are confined; and as the crop is consumed, the pen is changed to a fresh place, until the whole is fed off. This practice is very extensively adopted at Holkham, and is peculiarly calculated for light and dry soils. Its advantages are, that the grass is more economically consumed; that the stock thrive better, having daily a fresh bite; and that the dung that falls, being more concentrated, is more likely to be of use.

5017. *In the common pasturing of clover*, the stock are introduced into the field earlier than in tethering or hurdling, in order to avoid the loss that would be sustained by cattle or sheep treading *ad libitum* on tall herbage. Indeed, the principal advantage of pasturing clovers is, that sheep and lambs may be turned on them more early than on common grass-lands. Sometimes this advantage is taken for a month or six weeks, in the beginning of summer, and the field afterwards shut up for a crop of hay; but more frequently the red clovers are only pastured the second year. When white and yellow clovers are sown, the herbage is sometimes not mown at all, but pastured for three or more years, and sometimes a little red clover being sown along with these, a crop of hay is taken the first year.

5018. *The produce of clover-hay*, without any mixture of rye-grass, on the best soils is from two to three tons per acre, and in this state in the London market it generally sells 20 per cent. higher than meadow-hay, or clover and rye-grass mixed. The weight of hay from clover and rye-grass varies, according to the soil and the season, from one to three tons per English acre, as it is taken from the tramp-ricks; but after being stacked, and kept till spring, the weight is found to be diminished 25 or 30 per cent.

5019. *The value of clover and rye-grass hay*, in comparison with the straw of beans or pease, may be in the proportion of three to two; and with the finest straw of corn crops, in the proportion of two to one. One acre of red or broad clover will go as far in feeding horses or black cattle, as three or four of natural grass. And when it is cut

occasionally, and given to them fresh, it will, probably, go still much farther, as no part of it is lost by being trodden down. With the exception of lucern, and the herbage of rich marshes, there is no crop, by which so much stock can be supported, as by clover. It may be profitably employed in fattening sheep in spring, and with this food, they will soon be ready for the butcher. Afterwards, a crop of hay may be got, and two or three weeks after the hay has been taken off, sheep intended to be fattened on turnips, may be turned in, and kept there, until the turnips are ready for them.

5020. *The nutritive products of clovers* will be found in the table. (4984.)

5021. *The saving of clover seed* is attended by considerable labor and difficulty. Clover will not perfect its seeds, if saved for that purpose early in the year; therefore it is necessary to take off the first growth either by feeding or with the scythe, and to depend for the seed on those heads that are produced in the autumn. Seed-clover turns out to good account in those years when the crops are not injured by the blight, which is often fatal to them, or by the rains in the autumn, which sometimes prove their destruction; for the time of harvesting this seed falling out late when rainy weather may be expected, renders it, on that account, very tedious.

5022. *When the first crop is fed off*, it is eaten till about the end of May, frequently by ewes and lambs; and this is understood to be an advantageous practice, because the land is less exhausted, and the green food is of great value for stock in the spring months. It is not uncommon, however, to cut the first growth for a hay crop, and this should be done earlier than usual. The growth thus reserved for seed must be suffered to remain till the husks become perfectly brown, when it is cut and harvested in the usual manner, leaving it on the field till it is very dry and crisp, that the seeds may become more fully hardened; it may then be laid up dry, to be threshed out at the farmer's convenience. Much labor and expense are necessary in separating the seed from the capsule, or seed-coat, especially when it is effected by threshing, which seldom costs less than from five to six or seven shillings per bushel. By the use of mills the work may be done much cheaper.

5023. *The produce in seed* may generally be from three to four or five bushels per acre, when perfectly clean, weighing from two to three hundred weight. But there is great uncertainty in the produce of clover seed, from the lateness of the season at which it becomes ripe; and the fertility of the soil is considerably impaired by such a crop. Yet the high value of the seed is a great inducement to the saving of it, in favorable situations. (*Dickson's Practical Agriculture*, vol. ii. p. 863.)

5024. *The diseases of clover* are the blight or mildew, and suffocation or consumption, from insects, slugs, and worms. It often happens that clover after being repeated at short intervals on the same soil, either fails or does no good; whether that is owing to a disease or to a defect in some peculiar substance, which enters into the food of the plant, does not appear to be clearly ascertained. A top dressing with ashes or lime, is said to be unfavorable to the slug; but where vermin of this sort are very numerous, the most certain remedy is a naked fallow well worked in the hottest months.

Sect. II. Lucern. — *Medicago sativa*, L. *Diadel. Decan.* L. and *Leguminosae*, J. *La Lucerne*, Fr.; *Futterklee*, Ger.; and *Medica*, Ital. (fig. 569.)

5025. *Lucern* is a deep rooting perennial plant, sending up numerous small and tall clover-like shoots, with blue or violet spikes of flowers. It is a native of the south of Europe, and appears to be acclimated in the warmer parts of England. Lucern or medic is highly extolled by the Roman writers, and also the cytissus, the latter a low evergreen shrub. Lucern is much grown in Persia and Lima, and mown in both countries all the year round; it is also of unknown antiquity in old Spain, Italy, and the south of France. It was introduced to England from the latter country, according to Miller, in 1657. It is mentioned by Hartlib, Blythe, and other early writers, and was tried by Lisle; but it excited little attention till after the publication of Harte's *Essays*, in 1757. It is now only cultivated in a few places, and chiefly in Kent. Columella estimated lucern as the choicest of all fodder, because it lasted many years, and bore being cut down four, five, or six times a year. It enriches, he says, the land on which it grows, fattens the cattle fed with it, and is often a remedy for sick cattle. About three quarters of an acre of it is, he thinks, abundantly sufficient to feed three horses during the whole year. But though it was so much esteemed by the ancients, and has been long cultivated to advantage in France and Switzerland, it has yet found no great reception in this country. If any good reason can be given for this, it is, that lucern is a less hardy plant than red clover, requires three or four years before it comes to its full growth, and is for these and other reasons, ill adapted to enter into general rotations. Where the climate and soil suit, perhaps, a field of it may be advantageously sown, adjoining the homestead, to afford early cutting or food for young or sick animals, for which it is said to be well adapted; but though it will produce good crops for eight or ten years, yet from the time the



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farmer must wait till this crop attains its perfection, and from the care requisite to keep it from grass and weeds, we do not think it is ever likely to come into general culture.

5026. There are no varieties of the lucern deserving the notice of a cultivator. What is called the yellow lucern, or Swiss lucern, is the *Medicago falcata* (fig. 570.), a much more hardy and coarser plant, common in several parts of England, but not cultivated any where excepting in some poor soils in Switzerland.

5027. The soil for lucern must be dry, friable, inclining to sand, and with a subsoil not inferior to the surface. Unless the subsoil be good and deep, it is in vain to attempt to cultivate lucern. According to Young, the soils that suit lucern, are all those that are at once dry and rich. If, says he, they possess these two criteria, there is no fear but they will produce large crops of lucern. A friable deep sandy loam on a chalk or white dry marly bottom, is excellent for it. Deep putrid sand warp on a dry basis, good sandy loam on chalk, dry marl or gravel, all do well; and in a word, all soils that are good enough for wheat, and dry enough for turnips to be fed on the land, do well for lucern. If deficient in fertility, they may be made up by manuring, but he never yet met with any land too rich for it.

5028. The preparation of the soil consists in deep ploughing and minute pulverisation; and in our opinion, the shortest way to effect this, is to trench it over by the spade to two or three feet in depth, burying a good coat of manure in the middle or at least one foot from the surface. This is the practice in Guernsey, where lucern is highly prized.

5029. The climate for lucern, as we have already hinted, must be warm and dry; it has been grown in Scotland and Ireland, and might probably do well in the southern counties of the latter country, but in the former it has not been found to answer the commendations of its admirers.

5030. The season most proper for sowing lucern, is as early as can be done in the spring months, as in this way the plants may be fully established before the season becomes too hot. The latter end of March, for the more southern districts, may be the most proper period; and the beginning of the following month for those of the north. When sown late, there is more danger of the plants being destroyed by the fly, as has been observed by Tull. If the plants be intended to be transplanted out in the garden method, it will also be the best practice to sow the seed-bed as early in the spring as the frosts will admit, in order that they may be strong, and fit to set out about the beginning of August.

5031. The manner of sowing lucern is either broad-cast or in drills, and either with or without an accompanying crop of corn for the first year. Broad-cast, and a very thin crop of barley or other spring corn, is generally, and in our opinion, very properly preferred. Arthur Young, who has treated largely on this plant, observes, that "the greatest success by far that has been known, is by the broad-cast method, which is nearly universal among the best lucern farmers, even among men who practise and admire the drill husbandry in many other articles. But as they mostly (not all) depend on severe harrowing for keeping their crops clean, which is a troublesome and expensive operation, he still ventures to recommend drilling, but very different drilling from that which has been almost universally practised, viz. at distances of eighteen inches or two feet. Objections to these wide intervals are numerous. If kept clean hoed, the lucern licks up so much dirt, being beaten to the earth by rain, &c. that it is unwholesome, and the plants spread so into these spaces, that it must be reaped with a hook, which is a great and useless expense. For these reasons, as well as for superiority of crop, he recommends drilling at nine inches, which in point of produce, mowing, and freedom from dirt, is the same as broad-cast; and another advantage is, that it admits scarifying once a year, which is much more powerful and effective than any harrowing. These facts are sufficient to weigh so much with any reasonable man, as to induce him to adopt this mode of drilling, as nearer to broad-cast by far than it is to drills at eighteen to twenty-four inches, which open to a quite different system, and a set of very different evils. Nine inch rows might practically, but not literally, be considered as broad-cast, but with the power of scarifying. And in regard to the material point, of with or without corn, two considerations, he says, present themselves. One is the extreme liability of lucern to be eaten by the fly, which does great mischief to many crops when very young, and against which the growing of corn is some protection. The value of the barley or oats is another object not to be forgotten. It is also gained in the first year's growth of the lucern, which is very poorly productive even if no corn be sown, so that he must own himself clearly an advocate for drilling in among corn, either between the rows of nine inch barley, or across drilled barley, at a foot if perhaps the latter is the best method, as there is less probability of the crop being laid to the damage of the lucern. The quantity of seed-corn should also be small, proportioned to the richness of the land, from one bushel to a bushel and a half, according to the fertility of the soil, another security against the mischief of lodging. If these precautions are taken, it would be presumptuous to say that success must follow, that being always, and in all things, in other hands than ours; seed may prove bad, the fly may eat, and drought prevent vegetation, but barring such circumstances, the farmer may rest satisfied that he has done what can be done, and if he does succeed, the advantage will be unquestionable."

5032. The quantity of seed, when the broad-cast method is adopted, is said to be from 15 to 20 lbs. per acre, and from 8 to 12 if drilled. The seed is paler, larger, and dearer than that of clover: it is generally imported from Holland, and great care should be had to procure it plump and perfectly new, as two years old seed does not come up freely. The same depth of covering as for clover will answer:



5033. Lucern may be *transplanted*, and when the soil is very rich and deep, it is said to produce very large plants; but such plants, from the bulk of their stools, are not likely to be so durable as those of a less size, and on the whole, for this and other reasons relative to expense, the plan of transplanting does not seem advisable unless for filling up blanks.

5034. *The after-culture of lucern*, sown broad-cast, consists in harrowing to destroy grass and other weeds; rolling, after the harrowing, to smooth the soil for the scythe, and such occasional top-dressings of manure as the state of the plants may seem to require. Where lucern is drilled, horse-hoeing may be substituted for harrowing, which, as already observed, is the only advantage of that mode of sowing. The harrowing may commence the second year, and the weeds collected should always be carefully removed: light harrows may be used at first, and in two or three years such as are heavier. In succeeding years two harrowings may be required, one early in the spring, and the other at the close of the summer. For these, and especially the last, Arthur Young recommends the use of a harrow of such weight as is sufficient for four horses, and which does not cover a breadth of more than four feet. The mode of hoeing, either by the hand or horse-hoe, or of stirring by the drill harrow, requires no description.

5035. *The top-dressings* given to lucern may be either of the saline or mixed manures. Ashes are greatly esteemed, and also gypsum and liquid manure of any kind. Arthur Young advises to apply dung, in the quantity of about twenty tons to the acre, every five or six years. Kent, however, thinks it a better practice to put a slight coat on annually in the spring season. Some recommend a slight top-dressing sown by hand every spring. The farmer will in this, as in every case, exercise his own judgment, and be guided by the wants of the plants, the return they yield for the expense bestowed on them, and the equable distribution of manure among his other crops.

5036. *The taking of lucern* by mowing for soiling, or hay, or by tethering, hurdling, or pasturing, may be considered as the same as for clover. Lucern frequently attains a sufficient growth for the scythe, towards the end of April, or beginning of the following month; and in soils that are favorable for its culture, will be in a state of readiness for a second cutting in the course of a month or six weeks longer, being capable of undergoing the same operation, at nearly similar distances of time during the whole of the summer season. In this last sort of soil, with proper management, in the drill method, it has been found to rise to the height of a foot and a half in about thirty or forty days, affording five full cuttings in the summer. But in the broad-cast crops, in the opinion of some, there are seldom so many cuttings afforded in the season, three or four being more common, as the growth is supposed to be less rapid than by either of the other modes.

5037. *The application of lucern* is also the same as of clover. The principal and most advantageous practice, in the application of lucern, is that of soiling horses, neat cattle and hogs; but as a dry fodder, it is also capable of affording much assistance, and as an early food for ewes and lambs, may be of great value in particular cases. All agree in extolling it as food for cows, whether in a green or dried state. It is said to be much superior to clover, both in increasing the milk and butter, and improving its flavor. In its use in a green state, care is necessary, not to give the animals too much at a time, especially when it is moist, as they may be hoven or blown with it, in the same way as with clover, and other green food of luxuriant growth.

5038. *The produce of lucern*, cut three times in a season, has been stated at from three to five and even eight tons per acre. In soiling, one acre is sufficient for three or four cows during the soiling season, and a quarter of an acre, if the soil be good for all sorts of large stock, for the same period, or half an acre on a moderate soil. Say, however, that the produce is equal in bulk and value to a full crop of red clover, then, if continued yearly for nine or ten years (its ordinary duration in a productive state), at an annual expense of harrowing and rolling, and a triennial expense of top-dressing, it will be of sufficient value to induce farmers, who have suitable soils and climates, to lay down a few acres under this crop near their home-stalls.

5039. *The nutritive product of lucern*, according to Sir H. Davy, is 2½ per cent., and is to that of the clovers and saintfoin as 23 to 39. This result does not very well agree with the superior nutritive powers attributed to lucern.

5040. *To save seed*, the lucern may be treated precisely as the red clover, and it is much easier threshed, the grains being contained in small pods, which easily separate under the flail, or a threshing machine, or clover mill.

5041. *The diseases of lucern* appear to be the same as those of clover. In Kent, blight and the slug are its greatest enemies.

SECT. III. *Saintfoin*. — *Hedysarum Onobrychis*, L. *Diadel. Decan. L. and Leguminosae*, J. *L'espéract*, Fr.; *Espartzette*, Ger.; and *Cedrangola*, Ital. (fig. 571.)

5042. *Saintfoin* is a deep rooting perennial with branching spreading stems, compound leaves, and showy red flowers. It is a native of England and many parts of Europe, but never found but on dry warm chalky soils, where it is of great duration. It has been long cultivated in France and other parts of the continent, and as an agricultural plant was introduced from the latter country to England about the middle of the seventeenth century. It has since been a good deal cultivated in the chalky districts; and its peculiar value is, that it may be grown on soils unfit for being constantly under tillage, and which would yield little under-grass. This is owing to the long and descending roots of the saintfoin, which will penetrate and thrive in the fissures of rocky and chalky understrata. Its herbage is said to be equally suited for pasturage or for hay, and that eaten green it is not apt to swell or bloat cattle like the clovers or lucern. Arthur Young says, that upon soils proper for this grass no farmer can sow too much of it, and in *The Code of Agriculture* it is said to be "one of the most valuable herbage plants we owe to the bounty of Providence."



5043. There are no varieties of the saintfoin, but many other species of the same numerous family that might be cultivated, such, for example, as the French honeysuckle, a biennial, that might be substituted for red clover on rich soils.

5044. *The best soil* for this plant is that which is dry, deep, and calcareous; but it will grow on any soil that has a dry subsoil. Kent thinks that the soils most suited to the culture of this sort of grass are those of the chalky loam, and light sandy or gravelly kinds, or almost any of those of a mixed quality, provided they be not too wet, and have a rocky or hard calcareous bottom to check the roots at the depth of a foot or fifteen inches below the surface, which he, notwithstanding the above, conceives necessary, as the plants are apt to exhaust themselves in running down. And for this reason he considers it as improper for being sown where there is great depth of mould or soil. It is a plant that is asserted by Marshal to afford a large produce even on those soils which are of the poorest quality, and that on such as are of a more rich and friable nature it frequently produces abundant crops. Still, he conceives, that it is only in the calcareous soils, as the dry chalk and limestone, or such as have been well impregnated with that sort of matter, that it succeeds in a perfect manner or becomes durable. The advantages resulting from growing this plant on sandy soils in Norfolk have been already stated (4379.).

5045. *The best preparation* which any soil fit for this plant can undergo, is unquestionably that of trenching; and we have little doubt that in most cases, all things considered, it would be found the cheapest. The usual preparatory culture, however, is the same as for clover, ploughing however, deeper than ordinary, either by means of the trench plough, or, what is better because more simple, by the common plough going twice in the same track. Boys (*Communications to the Board of Agriculture*, vol. iii.) recommends as a preparation for saintfoin; 1st year, pare and burn for turnips, to be eaten on the land by sheep, with the aid of some fodder; 2d, barley, to be sown very early with clover seed; 3d, clover eaten off by sheep; 4th, wheat; 5th, turnips with manure; and, 6th, barley with saintfoin. The corn crops must be carefully weeded, and in particular cleared of charlock. Under this system, the produce has been great, and the ground has been laid down in the highest order with saintfoin, or any other grass calculated for this species of soil.

5046. With respect to the *season of sowing* saintfoin, it may be observed that the earlier it can be put into the soil in the spring the better, as from the greater moisture of such soils there will be a greater probability of their vegetating in a perfect manner. Where the sowing is executed at a late period, and dry weather succeeds, Bannister thinks that much of the seed would be prevented from growing, and the young plants be more exposed to the destruction of the fly; therefore, according to this writer, the sowing of saintfoin seed ought never to be deferred longer than the beginning of March, and that it is still better to complete this work in February. Some, however, suppose it may be deferred to the middle of March without injury.

5047. *The manner of sowing* is almost always broad cast, but it may be sown in drills and even transplanted, though neither of these modes can be recommended. Some advise its being sown with about half the quantity of barley which is usually sown for a full crop, as it may shade and keep it moist during the first summer, and at the same time not injure it from the crop being lighter, which is sometimes the case. Where the barley is drilled the saintfoin may afterwards be put in, in the same manner, but in a contrary

direction. If sown over the wheat it should be harrowed in, and afterwards rolled. In whatever method it is sown, as the seeds are larger than those of many other herbage plants, they should be covered in with more care, and to a somewhat greater depth. By some the ploughing the seed in with a very thin or shallow furrow is recommended. In most cases, especially in all the more light sorts of land in which this sort of crop is grown, the use of the roller may be necessary immediately after the seed is put into the ground. It is the practice in some districts to sow a small portion of clover seed with saintfoin, with the idea of increasing the first year's produce; but as plants of different kinds seldom answer well when grown together, from there being a continual contest in their growth for an ascendancy, it is perhaps a better method to increase the proportion of the seed, without mixing it with that of other sorts. It is, however, supposed by Marshall that such a practice is beneficial in ultimately procuring a fine clean crop of saintfoin upon the land. It is a sort of crop that grows in so perfect a manner in the broad-cast method, that there can seldom be any necessity for having recourse to the drill. It may, however, be cultivated in the latter mode with much success. And in Norfolk, it is the practice with some cultivators to have it drilled at nine inches across the barley crops which have been sown in the same way.

5048. *The quantity of seed in the broad-cast method*, which is that mostly employed, is about four bushels the acre, though less is frequently given; but on such soils as are proper for this plant it is always necessary to have a full proportion of seed. By some, however, a much smaller quantity is made use of, and where the drill system is had recourse to, a still smaller proportion is used, as from two to two and a half, or three bushels. It has been observed, that in Lincolnshire, where this plant is much grown, "the common allowance of seed is five bushels to an acre, and that a gentleman south of Lincoln advises the sowing a small quantity of trefoil with it (about four pounds on an acre). The reason for which is, that in that exposed country, the young plants suffer more by the sun in summer than by the frost in winter. Of course the trefoil coming to perfection the first year, and living only three, will be a shelter for the young plants during the first year or two, and die off when the saintfoin wants its room.

5049. *In the choice of the seed* it is the best practice for the cultivator to select it from the best and most abiding plants in his particular soil, as such as is purchased from the seed-shops can rarely be depended upon. A certain method of knowing the goodness of the seed is, by sowing a number of the seeds, and seeing how many plants are produced by them. But the external signs of the seeds being good are, that the husk is of a bright color, and the kernel plump, of a light grey or blue color, and sometimes of a shining black. The seed may be good, though the husk be black, as that is owing sometimes to the letting it receive wet in the field, and not to its being half rotted in the heap. If the kernel be cut across, and appear greenish and fresh, it is a certain sign that it is good. But if it be of a yellowish color, and friable, and looks thin and pitted, they are bad signs. But others observe that the best seed is that which is plump, heavy, bright, and of a yellowish red color, and that it should always be sown while quite fresh, as that which is old, or that has been long kept, never vegetates in a perfect manner. In purchasing seed of this sort it is in general from about three to five shillings the bushel.

5050. *The after-culture and management of saintfoin* consists in occasional dressings with manure, and in the judicious intervention of mowing and pasturing. The first year some farmers do not mow, while others do; but the second year, and in the succeeding summers, a crop of hay may be taken, and the after-grass be fed down with any sorts of stock but sheep, till towards December, care being taken that they do not eat it in too close a manner, as where that is the case, from the largeness of the roots, they may be in danger of injuring the crowns of the plants. In the following autumn there will however be less risk in this respect, and sheep as well as cattle stock may be turned in and kept upon the pastures till they are well eaten down, being always careful to shut them up as early as possible in the beginning of the year. This is the opinion of Kent. And it is supposed that as this sort of herbage is considered to be improved in its taste by being nipped by the frost, it may be a proper practice not to turn stock upon these leys too early in the autumnal season. With this intention it may be advisable to defer it till the latter end of September, when this sort of rouen or after-grass will be found to have much effect in promoting the flow of milk in cows, as well as in forwarding the condition of fattening beasts; great store of feed being still left for sheep. But with this sort of stock they should not be too closely fed down, or the sheep remain too long upon them, as much injury may be sustained by it. It has been suggested that all sorts of cattle stock should be removed, by the beginning of the year from these rouens, as much harm might be done by their continuing longer.

5051. *In top-dressing saintfoin* peat-ashes are the best material that can be made use of where they can be procured in sufficient quantity. And other sorts of ashes are likewise found beneficial where

these cannot be had. They should be applied so as to form a thin, even, regular dressing over the whole surface of the crop. In this view soot has also been found of great utility when spread evenly over such leys about the beginning of January, in the proportion of about twenty-five or thirty bushels to the statute acre. And malt-dust has been employed in the same way with great success and advantage, as shown by Bannister in his *Synopsis of Husbandry*. And it is supposed that where those sorts of top-dressings can be applied every third or fourth year, the saintfoin crops, when well established in the soils, may be preserved in a state of vigorous growth for ten or fifteen years, or more, and the land be considerably improved by the roots striking so deeply into it.

5053. *In taking and using the saintfoin crop, the same practices may be followed as in taking clover*: it may be mown for soiling, or hay, or seed; and eaten on the spot by tethering, hurdling, or common pasturing. In making it into hay it is cut immediately on its coming into full blossom, and as it remains but a short time in this state, as much expedition as possible should be employed both in mowing and making the produce into hay. It is remarked by the author of *The Synopsis of Husbandry*, who resides in a district where the culture of saintfoin is frequent, that of all other hay plants, it requires the least pains in making; when the season is favorable, the hay-makers may follow the scythe, and having turned over the swaths, throw them into wind rows the succeeding day after the crop is mown, when it may be immediately formed into cocks, and the whole crop be fit for carting in a week after it is mown; and though it may appear very green, and the stack when made take on or acquire a considerable degree of heat, there is no danger to be apprehended, provided the weather has been fair during the hay-making; as it is so far from taking harm by heating in the stack, that the contrary state is the most to be feared; and for this reason great care is necessary not to suffer the fodder to continue long either in the swath or in cocks, lest the sun and wind should dry it up too fast, and by exhaling its juices prevent the heating in the stack, and thereby render it of little value. In order to preserve its succulence, in some places they put a number of these cocks together, so as to form large cocks of a size to contain a load in each, and finish the stacks out of the cocks. And it is likewise a practice with many farmers, where the crop is slight, to turn the swaths, and then run them into cocks with a three-pronged barley fork, following with a wooden dew-rake, the head of which is of sufficient width to cover the ground occupied by three or four swaths, in this manner proceeding with the utmost dispatch, saving a deal of labor and expense in the business.

5053. In regard to the frequency of cutting saintfoin, it is probable that on the thinner sorts of soils it can seldom be done more than once; but on those of the deeper sorts two crops may sometimes be taken, in the same manner as with clover, care being taken in these cases, that the future growth of the plants be not injured by this means.

5054. *The usual duration of saintfoin*, in a profitable state, is from eight to ten years. It usually attains its perfect growth in about three years, and begins to decline towards the eighth or tenth on calcareous soils, and about the seventh and eighth on gravels. There are instances, however, of fields of saintfoin, which had been neglected and left to run into pasture, in which plants have been found upwards of fifty years from the time of sowing. It has been cultivated upwards of a century on the Cotswold hills, and there roots of it have been traced down into stone quarries from ten to twenty feet in length, and in Germany Von Thaeer found them attain the length of sixteen feet. In general the great enemy to the endurance of saintfoin is the grass which accumulates, and forms a close turf on the surface, and thus chokes up the plant.

5055. *The quantity of produce on a medium of soils and cultivation*, may probably be estimated at from about one and a half to two tons the acre. And on the poorer and thinner staple sorts of land, it will perhaps seldom afford less than from a ton to a ton and a half on the acre.

5056. *The nutritive products of saintfoin* are the same as clover; viz. $3\frac{2}{10}$, being $1\frac{1}{10}$ per cent. more than those of lucern.

5057. *In saving seed from saintfoin*, it should remain on the land till the husks become of a somewhat brownish color, and the seeds are perfectly plump and firm, as by these means they will not only be better in their quality, but be in less danger of being injured in the field from the very short time that it will be necessary for them to remain, and also less in danger of being hurt by heating when laid up for future use. It has been stated, that it requires some experience to know of what degree of ripeness it is best to cut the seeded saintfoin; because all its seeds do not ripen at the same time. Some ears blossom before others; every ear begins blossoming at its lower part, and continues to blow gradually upwards for many days; so that before the flower is gone off at the top, the seeds are almost mature at the bottom. By this means, if the cutting be deferred till the top-seeds are quite ripe, the lower, which are the best, would shed and be lost.

5058. *The best time to cut it* is when the greatest part of the seed is well filled, the first blown ripe, and the last blown beginning to be full. The unripe seeds will ripen after cutting, and be, in all respects, as good as those that were ripe before. Some, for want of observing this, have suffered their saintfoin seed to stand till all of it has shed, and been lost in cutting. Saintfoin should never be cut in the heat of the day, while the sun shines out; for then much, even of the unripe seed, will shed in mowing. The right time for this work is the morning or evening, when the dew has rendered the plants supple. When the weather is fine and clear, the saintfoin will soon dry sufficiently in the swaths, without turning them; but if any rain has fallen, and there is a necessity for turning them, it should be done very gently while they are moist, and not two swaths together, as in the other hay made of saintfoin before it has seeded. If the swaths are turned with the handle of the rake, it is best to raise up the ear-sides first, and let the stub-side rest on the ground in turning; but if it is done with

the teeth of the rake, let the stub-side be lifted up, and the ears rested on the earth. If it be cocked at all, the sooner it is done the better; because, if the swaths are dry, much of the seed will be lost in separating them, the ears being entangled together. When moist, the seeds stick fast in the ear; but, when dry, it drops out with the least touch or shaking. It is, however, the best practice, as soon as the proper degree of maturity has been attained by the crop, that it should be mown in as short a time as can possibly be made convenient, and remain exposed in the swath until the upper surface is fully dried, when it must be wholly turned over, but in a very careful manner, so as to prevent the seeds from shedding and being lost, as much as the nature of the work may admit of. When this side has been rendered perfectly dry and crisp in the same way as the other, the crop should either be threshed out upon cloths in the field where it is grown, or laid up in stacks to be afterwards performed when the farmer has more leisure and convenience for the work.

5059. *The work of threshing out the seeds* in this kind of crop is much less troublesome and expensive than in that of the clover kind. In cases where threshing-machines are in use, the business may be executed with great ease and facility in that mode. It has, however, been observed by a late writer, that "when the season is favorable, the practice of threshing it out in the field is probably the most beneficial, as the stems or haulm may be laid up for the purpose of fodder in the stack."

5060. *As the threshing in the field* cannot be done but in very fine weather, and while the sun shines in the middle of the day, the best manner of performing it is to have a large sheet pegged down to the ground, for two men to thresh on with their flails, while two others bring them fresh supplies in a smaller sheet, and two more clear away the hay that has been threshed. The seed is emptied out of the larger sheet, and riddled through a large sieve, to separate it from the chaff and broken stalks; after which it is put into sacks, and carried into the barn to be winnowed. Care should be taken not to let the hay get wet, as in that case it would be spoiled. It is a very important, but difficult matter, to keep the seed that has been threshed in the field, without becoming wet. If it be winnowed immediately, and only a little of it laid amidst a great heap, or put into a sack, it will ferment to such a degree in a few days, that the greatest part of it will lose its vegetative quality. During that fermentation it will be very hot, and smell sour. Spreading it upon a barn-floor, though but seven or eight inches thick, will answer no end, unless it be frequently and regularly turned, until the heating is over: but even this will not make its color keep so bright as that which is well housed, well dried, and threshed in the winter. This last, laid up and unthreshed, will keep without any danger of spoiling, because it does not lie close enough to heat. The best way to preserve the seed threshed in the field is to lay a layer of straw upon a barn-floor, and upon that a thin layer of seed, then another layer of straw, and another layer of seed, and so on alternately. By this means the seed, mixing with the straw, will be kept well, and come out in the spring with as fresh a color as when it was put in.

5061. *In respect to the produce in seed*, it is said to be usually "from about four to five sacks in some districts, but in others it will probably be much less, especially on the shallower sorts of saintfoin soils." But this must obviously be liable to great variation from season, &c.

5062. *The diseases of saintfoin* are few, there being little danger of failure after it has escaped the fly, which attacks the clover tribe in germinating.

SECT. IV. *Of various Plants which are or may be cultivated as Herbage and for Hay.*

5063. *Among the inferior herbage plants* which are occasionally cultivated, are burnet, ribwort, chiccory, furze, and spurry. Those which might be cultivated are very numerous, and include several species of vicia, lathyrus, galega, lotus, trifolium, medicago, and others of the native leguminosæ, or pea-like flowering plants; and achillea, alchemilla, cheiranthus, spartium, apium, and a variety of others of different families. With the exception of the chiccory and furze, there are none of these plants that deserve the attention of the professional farmer; ribwort and burnet are occasionally sown; but they are of little value as hay plants, and in most pastures their place might be more advantageously occupied by one or other of the natural grasses. With respect to the other plants enumerated, they have never been tried but by way of experiment, and are only mentioned as resources under peculiar circumstances, and as a field of inquiry and exertion for the amateur cultivator.

5064. *The burnet (Poterium sanguisorba, L. fig. 572.)* is a native plant, a hardy perennial with compound leaves, blood-colored flowers, and a long tap-root. It was originally brought into notice by Roque, a commercial gardener, at Walham green, near London, who found means to procure the patronage of the Dublin and other societies to this plant, which, being a novelty, attracted the attention, and called forth the eulogies of Arthur Young, and other leading agriculturists of the day. Miller, however, at the time observed, that whoever will give themselves the trouble to examine the grounds where it naturally grows, will find the plants left uneaten by the cattle, when the grass about them has been cropped to the roots; besides, in wet winters and on strong land, the plants are of short duration, and therefore very unfit for the purpose of pasture or hay, nor is the produce sufficient to tempt any persons of skill to engage in its culture.

5065. *Curtis* says of burnet, that it is one of those plants, which has for some years past been attempted to be introduced into agriculture, but not answering the farmer's expectations is now in a great degree laid aside. Cattle are said not to be fond of it; nor is its produce sufficient to answer the expense attending its culture. It is to be lamented that persons do not pay a little attention to the nature of plants before they so warmly recommend them. It seems very unlikely that a small plant, scarcely ever met with but on hilly and chalky ground, and to which cattle in such situations do not show any particular attachment, should afford better, or more copious nourishment, than the clovers and other plants already in use.



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5066. According to Boys, in *The Agricultural Survey of Kent*, it affords herbage in the winter and spring months, but is not much liked either by cattle or sheep.

5067. Dr. Anderson reports, that burnet retains its verdure pretty well during the winter months, but affords such scanty crops, as hardly to be worth the attention of the farmer.

5068. A correspondent in the *Museum Rusticum*, a work very favorable to burnet, confesses with reluctance that it is not deserving of any exalted character, but rather the contrary; and that it is in no degree to be compared to the common clover, which is cultivated at half the expense. It appears from some accounts there, that horses will not eat it at all, and that kine frequently will not take it without great reluctance. Its slow growth is also made a great objection: being only about five inches high, and having scarce one head in flower; whilst lucern on the same soil, sown the same day and much thicker, was eighteen or twenty inches in height. It is not meant by this, however, to discourage that laudable spirit of improvement which so happily prevails at present; but to caution such as introduce any new plant, to make themselves well acquainted with its natural history.

5069. Those who wish to cultivate burnet as an herbage and hay plant, may treat it exactly as directed for saintfoin; as a pasture plant it is sown among the grasses in the same way as white or yellow clover. A bushel of seed is commonly sown to an acre.

5070. The ribwort plantain, (*Plantago lanceolata*, L. fig. 573.) is a hardy native with a tuft of long-ribbed leaves springing from the crown of the root, long naked flower-stems, and a long moniliform tap-root. It abounds in dry soils, as do several other species of plantain, especially the *P. media*. On dry soils it affords little herbage, and is often left untouched by cattle. Curtis, Withering, and other British botanists, speak unfavorably of the ribwort as a pasture herbage; but Haller attributes the richness of the milk in the Swiss dairies to the flavor of this plant, and alchemilla, in the mountain pastures. In rich moist or watered lands, its herbage is more abundant, and its flavor altered, a circumstance not uncommon in the vegetable kingdom, but from which it does not always follow that the plant so altered, is deserving of culture. In conformity with this observation, though the ribwort be a scanty and rejected herbage, on poor dry soils, it is said by Zappa, of Milan, to grow spontaneously in every meadow of Lombardy, especially in those which are irrigated. It vegetates early, flowers at the beginning of May, ripens in five weeks, and is cut with the poa trivialis; the height of the leaves is about one foot, and of the stalk a foot and a half; it multiplies itself much by the seed and a little by the roots, which it continues for some time to reproduce. Ribwort is eaten heartily by every sort of cattle, and in particular by cows, who like it most in May, when it has great influence on the milk; as the hay has on the flesh. — Where kept well fed down by stock, there can be no doubt of its being a very good and nourishing pasturage plant for both cattle and sheep; but it is by no means adapted for hay, or soiling.

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5071. Young says, that he had long before recommended this plant for laying land to grass, and sowed it on his own farm. At the same time he thinks it extravagant to propose dandelion and sorrel, as plants proper for a cow pasture; and conjectures that those plants being found among good ones, have qualities given them, which do not properly belong to them; he is likewise inclined to make the same conjecture in respect to narrow-leaved plantain, ribwort or rib-grass, and should even have preferred dandelion and sorrel to it: but he is cautious of opposing theory to practice.

5072. Dr. Anderson states that narrow-leaved plantain or rib-grass is well liked by horses and cattle, and yields a very good crop upon rich ground tending to dampness, if it is at the same time soft and spongy; but that upon any soil which has a tendency to bind, or upon dry ground, it furnishes a very scanty crop. It has been made use of in some parts of Yorkshire as a summer grass. As an article of pasturage for cattle and sheep it is there in high esteem: it is not however well eaten by horses; and as an article of hay it is held to be detrimental to the crop; retaining its sap an unusual length of time; and when fully dry falls into a small compass, or is broken into fragments and left behind in the field.

5073. The culture of the plantain is the same as that of clover; its seed is about the same size, and consequently the same proportion of it will sow an acre.

5074. The chiccory (*Chicorium intybus*), wild endive or succory, L. (fig. 34.), has long, thick, perpendicular roots, a tuft of endive or lettuce-looking leaves, and when it shoots into flower its stems rise from one to three feet high, rigid, rough, branched, and clothed with leaves and blue flowers. It is found wild in dry calcareous soils in England and most parts of Europe of similar or greater temperature. It is cultivated in France as an herbage and pasturage plant, and in Germany and Flanders for its roots, from which a substitute for coffee is prepared. It was first cultivated in this country about 1780 by Arthur Young, who holds it in very high estimation. It is of such consequence, he says, for different purposes of the farm, that on various sorts of soil the farmer cannot, without its use, make the greatest possible profit. Where it is intended to lay a field to grass for three, four, or six years, in order to rest the land, or to increase the quantity of sheep food, there cannot, he thinks, be any hesitation in using it. There is no plant to rival it. Lucern, says he, demands a rich soil, and will

always be kept as long as it is productive; but upon inferior land it is not an equal object. Upon blowing sands, or upon any soil that is weak and poor and wants rest, there is no plant, he supposes, that equals this. On such sort of blowing poor sandy lands, as many districts abound with, especially in Norfolk and Suffolk, it will yield a greater quantity of sheep food than any other plant at present in cultivation. On fen and bog-lands and peat-soils, it also thrives to much profit. On all land where clover from having been too often repeated is apt to fail, chiccory may be substituted to great advantage. It does very well for soiling cattle both lean and fattening. It is of excellent use for those who keep a large stock of swine; and it does exceedingly well in an alternate system of grass and tillage, as it will last four, five, six, and even more years; but it should not be sown with any view of making hay in this climate, though it forms a considerable proportion of many of the best meadows in the south of France and in Lombardy. It has, however, he adds, been objected to, on the grounds of its rising and becoming a vivacious weed in succeeding crops. And if this circumstance be not guarded against, this will, he says, happen; but not more or so much as with lucern. But who, he asks, ventures to forbid chiccory culture on account of this quality, which is really founded on its merit: when the land is ploughed, says he, only use a broad sharp share, and harrow in tares for feeding or soiling, or break it up for turnips, and there is an end of the objection.

5075. *The culture of chiccory is the same as of clover.* As the plant is grown in gardens for culinary purposes, the seed may be procured in the seed shops, gathered in many places from wild plants, or saved by the grower. It is small, flat, black, and resembling that of lettuce; it should be procured fresh, and from eight to twelve pounds an acre are usually sown. The culture of this plant for its roots has been noticed in giving the outline of the agriculture of Flanders, and will be adverted to in a succeeding Chapter.

5076. *The whin, furze, or gorze, (Ulex europæus, L. fig. 574.),* is a well known shrub, found wild on dry light soils, and in rather hilly situations, in the warmer and more temperate parts of Europe, but not in Sweden, or in Russia, or Poland, north of Cracow and Casan. It has been known as a nourishing food for cattle from a very early period, and has been sown in some parts of England for that purpose and for fuel. Dr. Anderson knows few plants that deserve the attention of the farmer more than the whin. Horses are peculiarly fond of it, so much so that some persons think they may be made to perform hard work upon it, without any feeding of grain; but he thinks it tends more to fatten a horse than to fit him for hard labor, and that therefore some grain should be given with it where the work is severe. Cattle, he says, eat it perfectly well when thoroughly bruised, and grow as fat upon it as upon turnips; but unless it be very well bruised for them, they will not eat it freely, and the farmer will be disappointed in his expectations. Cows that are fed upon it yield nearly as much milk as while upon grass, which is free from any bad taste, and the best winter-made butter he ever saw, was obtained from the milk of a cow that was fed upon this plant. This food should be made use of soon after being prepared. Two bushels, with a proper allowance of hay, have been found to be sufficient for a day for three horses performing the same labor as with corn. It also seemed useful to horses laboring under broken-wind and grease. Poor hungry gravelly soils, which would not have let for five shillings an acre, have also been rendered worth twenty shillings by sowing them with furze-seed, in places where fuel has been scarce, this being frequently used for heating ovens, burning lime and bricks, and also for drying malt; but it is not worth cultivating in countries where fuel of any kind is cheap, or upon such lands as will produce good grass, corn, or other crops employed as the food of animals.

5077. *The culture of the whin is thus given by the same author.* "A field of a good dry loamy land, being well prepared, he sowed, along with a crop of barley, the seeds of the whin in the same way as clover is usually sown, allowing at the rate of from fifteen to thirty pounds of seed to the acre. The seeds, if harrowed in and rolled with the barley, quickly spring up and advance under the shelter of the barley during the summer, and keep alive during the winter. Next season, if the field has not a great tendency to run to grass so as to choke them, they advance rapidly after Midsummer, so as to produce a pretty full crop before winter. This you may begin to cut with the scythe immediately after your clover fails, and continue to cut it as it is wanted during the whole of the winter; but it is supposed, that after the month of February the taste of this plant alters, as it is in general believed that after that time horses and cattle are no longer fond of it. He, however, observes, that never having had a sufficiency of whins to serve longer than towards the middle of February, or beginning of March, he cannot assert the fact from his own experience. He has frequently seen horses beating the whins with their hoofs, so as to bruise the prickles, and then eat them, even in the months of April and May; and he says, that sheep which have been used to this food, certainly pick off the blossoms and the young pods at that season, and probably the prickles also, so that it is possible the opinion may only be a vulgar error. This, he thinks, the best way of rearing whins as a crop for a winter food for cattle or horses. But for sheep, who



take to this food very kindly when they have once been accustomed to it, less nicety is required; for if the seeds be simply sown broadcast, very thin (about a pound of seed per acre) upon the poorest soils, after they come up the sheep of themselves will crop the plants, and soon bring them into round close bushes, as this animal nibbles off the prickles one by one very quickly, so as not to be hurt by them. Sheep, however, who have not been used to this mode of browsing do not know how to proceed, and often will not taste them; but a few that have been used to the food will, he observes, soon teach all the rest how to use it.

5078. *Another very economical way of rearing whins*, but which he has seen practised rather than experienced himself, is this: let a farm be enclosed by means of a ditch all round, with a bank thrown up on one side, and if stones can be had, let the face of that bank be lined with the stones, from bottom to near the top, this lining to slope backwards with an angle of about sixty or seventy degrees from the horizon. Any kind of stones, even round ones gathered from the land, will answer the purpose very well; upon the top of the bank sow whin-seeds pretty thick, and throw a few of them along the face of the bank. Young plants will quickly appear. Let them grow for two years, and then cut them down by means of a hedge-bill, sloping down by the face of the bank. This mode of cutting is very easy, and as the seeds soon insinuate themselves among the crannies of the stones, the whole face of the bank becomes a close hedge, whose shoots spring up with great luxuriance. If another ditch be made on the other side of the bank, and if this be managed in the same way, and the hedge cut down only once every second year (and in this way it affords very good food for beasts), the inside and outside being cut down alternately, the fence will at all times continue good, as the hedge at the top will at all times be complete. This mode of rearing whins is, he remarks, both convenient and economical. But where stones cannot be obtained for making the facing, the bank very soon moulders down, and becomes unfit for the purposes of a fence. Circumstances have, he says, prevented him from ascertaining what is the weight of the crop that may be thus attained, but he thinks he may safely venture to say, that it is at least equal to that of a crop of green clover; and if it be considered, that this affords a green succulent food during winter, on which cattle can be fattened as well as on cut grass in summer, it will, he thinks, be admitted, that it must be accounted even a more valuable crop than clover. After being cut, he also remarks, that it springs up the following season with greater vigor than before, and in this situation acquires a degree of health and succulence very different from what it is ever observed to possess in its natural state. He has seen shoots of one season near four feet in length. The prickles too are so soft, and the stems so tender, that very little bruising is necessary; indeed horses, that have been accustomed to this food, would eat it without any bruising at all; but cattle, whose mouths seem to be more tender, always require it to be well bruised. How long crops of this sort may continue to be annually cut over, without wearing out, he cannot say, but he believes a long while in favorable circumstances; however, one thing is necessary to attend to in order to guard against its being destroyed: as, during the beginning of the season, nature seems to be solely employed about the great work of fructification only, and it is not till near Midsummer that the whin begins to push forth its wood-bearing branches, which advance with great luxuriance only during the latter part of the season, it may happen, that if care be not taken to have the grass that springs up on the field, before the whin begins to send out its shoots, eaten close down, that grass will acquire such a luxuriance before the young branches of the whin begin to advance, as to overtop them, and choke them entirely. Whoever, therefore, has a field under this particular crop, must, he says, be careful to advert to this circumstance, or if the field be in good heart, he will infallibly lose it. The field therefore should be kept as a pasture, bare as possible during the beginning of the season, and the cattle should only be taken from it when the shoots of the whin are discovered to begin to advance with vigor. Under this management, he presumes, it may be kept for many years, and yield full crops; but unless the mowers be particularly attentive at the beginning, to cut it as low as possible, it will very soon become impossible to cut the field with a scythe, as the stumps will soon acquire so much strength as to break the scythe when it happens to touch them.

5079. *The spurry*, (*Spergula arvensis*, L. fig. 63.) is a diminutive annual weed, on dry sandy corn-lands, in most parts of Europe. In Germany and the Netherlands, it is sown on the corn stubbles, and in the intervals of time that occur between some crops is fed with sheep. It may be sown and reaped in eight weeks, either in autumn or spring. It is said to enrich the milk of cows, so as to make it afford excellent butter; and the mutton fed on it is preferable to that fed on turnips. Hens eat spurry greedily, and it is supposed to make them lay a great number of eggs. Whether in hay, or cut green, or pasture, Von Thaeer observes, it is the most nourishing, in proportion of its bulk, of all forage, and gives the best flavored milk and butter. It has been recommended to be cultivated in England; but it is not likely that such a plant can ever pay the expense of seed and labor in this country, even on the poorest soil, or at all events, as Professor Martyn observes, we have many better plants for such soils.

5080. *The common broom*, (*Spartium scoparium*, L. fig. 575.) is cultivated in the southern parts of France, on the poorer sorts of soil, in the same way as hemp, for the purpose of stripping the bark from it, and converting it into a kind of thread. It is likewise cultivated in these places as a winter-food for sheep, and it is said they eat it with great avidity, preferring it to many other plants. It is, however, liable to produce diseases of the urinary passages, by its diuretic qualities. It has been recommended by Young, to be cultivated in England, as food for sheep and horses, who are said to eat it after they get accustomed to it; also for thatch, ropes, besoms, food for bees, fuel, and burning on the spot to improve the soil. Its culture is the same as that of the whin; but very peculiar, indeed, must be that situation, where its culture is attempted for any of the above purposes. It is a useful protection of game in plantations, from which source abundance may be had for besoms. The Spanish broom, (*S. junceum*, L.



fig. 576.) might be grown perhaps still more advantageously than the common species.

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5081. *The parsley*, (*Apium petroselinum*, L. fig. 577) is a well known biennial with a large sweet tap-root. It is a native of Sicily, but endures the British winter like a native plant. It is sown along with clover and grass seeds in some places, and especially in Lincolnshire, as a preventive of the rot in sheep. Fleet, of Hampshire, famous for curing the rot in sheep, cultivates it largely with success; he sows half a bushel to the acre, with a bushel of rye-grass, with spring corn; and he finds that it lasts in the ground till it is permitted to seed. He feeds it constant-

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ly, it being excellent for sheep, and when suffered to get a-head pigs feed wonderfully upon it in the autumn. After September, it will not, he says, run to seed. When it was ploughed up he obtained good oats. The land was poor, and in the next round of the course, the clover was much the better for the parsley having been sown or the clover omitted; for in a field half parsley, half clover, when the clover came again to be sown, it was excellent on the parsley half, but bad on the clover part. In laying down land to grass, Hoyte, in the fourth volume of *Communications to the Board of Agriculture*, advises the sowing with twelve pounds of white clover, two pounds of red clover, two pecks of rye-grass, and two pounds of parsley to the acre, as the parsley stands two years, and by its diuretic qualities prevents the sheep from dying of the red-water, which too luxuriant clovers are apt to produce. It has also been sown with success in Scotland, where it was greedily eaten by horses, cows, and hogs. The seed requires a longer period to germinate than that of any other agricultural plant, and might probably be advantageously prepared by steeping and turning. It must be fresh, as two year old seed will not grow; it is easily procured by the pound or bushel, from the seedsman, and as easily raised by letting a few drills in a garden shoot into flower stems.

5082. *The wall flower*, (*Cheiranthus cheiri*, L.) is a well known garden flower, and at the same time a native, and very hardy on dry soils. Like the parsley it is an antiseptic, and has been recommended to be cultivated for the same purposes, and in the same manner.

5083. *The bird's foot trefoil*, (*Lotus corniculatus*, L. fig. 578.) has been tried as a substitute for white clover on moist lands, and seems to succeed very well, but to have no particular advantages over the clover.

5084. *The oriental bunias*, (*Bunias orientalis*, L. fig. 579 a.) is a perennial

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plant, with leaves, branches, and its general habit of herbage, not unlike the wild chicory. It is a native of the Levant, and has been cultivated by way of experiment in the

grass garden, at Woburn. It is less productive than chiccory, bears mowing well, and affords the same nutriment, in proportion to its bulk, as red clover. (*Agricul. Chem.* p. 374.)

5085. *The yarrow* (*Achillea millefolium*, L. fig. 579 b.), the *common and alpine ladies' mantle* (*Alchemilla vulgaris* and *alpina*, L.), and others have been tried among perennial grasses, sown in parks, with a view to give flavor to milk, butter, mutton, and venison. Sinclair considers yarrow as an essential ingredient of the most fattening and healthy pastures. In all the pastures most celebrated for fattening or dairy produce, which he examined in Devonshire, Lincolnshire, and in the vale of Aylesbury, yarrow was present more or less in every part of the surface. (*Hort. Gram. Wob.* 2d edit. 412.)

CHAP. VI.

Of the cultivated Grasses.

5086. *The forage or hay and pasture grasses*, of which we are now about to treat, are found clothing the surface of the earth in every zone, attaining generally a greater height, with less closeness at the root in the warm climates; and producing a low, close, thick, dark green nutritive herbage, in the cooler latitudes. The best grass pastures, those which are most productive and nutritive, are such as are found in countries that have least cold in winter, and no excess of heat in summer. Ireland, Britain, and part of Holland and Denmark, may equal or surpass any countries of the world in this respect; but in every zone where, there are high mountains, there are certain positions between the base and summit, where, from the equability of the temperature, turf may be found equal to that in marine islands. It is a singular circumstance in regard to grasses, that in the greater part of North America, the sorts that grow naturally on the plains are almost all annuals, and consequently with the first frost they die, and the ground remains naked till a fresh crop rises from the self-sown seeds next spring. Nearly the same thing may be said of Poland and Russia, excepting on the banks of rivers and on the mountains.

5087. *The universal presence of the forage grasses*, and the rapidity with which all soils become covered with them when left uncultivated, is the obvious reason why their systematic selection and culture is but of recent date. Though the Romans cultivated clovers, and were careful of their meadows, it does not appear that the seeds of the proper grasses were collected and sown by them. None of the agricultural writers, from Peter of Bologna to Parkinson in 1640, say a word about sowing grasses, though they all mention clover and lucern. This branch of culture appears to have originated in England about the middle of the seventeenth century, and the grass made choice of was the rye-grass. The first mention made of it for cultivation is in Dr. Plot's *Oxfordshire*, printed in 1677. "They have lately sown," says he, "ray-grass, or the gramen loliaeum, by which they improve any cold, sour, clay-weeping ground, for which it is best, but good also for drier upland grounds, especially light stony or sandy land, which is unfit for sainfoin. It was first sown in the chiltern parts of Oxfordshire, and since brought nearer Oxford by one Eustace, an ingenious husbandman of Islip, who, though at first laughed at, has since been followed even by those very persons that scorned his experiment." The first grass tried after rye-grass, appears to have been the *Phleum pratense* by Rocque of Walham Green, about 1760. Soon after the seed of cock's-foot grass was introduced from Virginia, under the name of orchard-grass, by the Society of Arts (*Ann. Reg.* 1765, 141.); fox-tail was tried at a later period, from the suggestions of Sillingsfleet and Curtis.

5088. *Sillingsfleet*, about 1759, drew the attention of the reading agriculturist to the selection of different species of grasses; as did Dr. Anderson about the same time, and Swayne (*Gramina Pascua*), and Curtis (*Observations on British Grasses*), soon afterwards. The origin of this attention to grasses and native plants may be traced to the practice of forming local floras by botanists, and especially to the *Flora Suedica* of Linnaeus; and the *British Floras* of Hudson, Withering, Lightfoot, Smith, &c. in which the medical and economical properties of the plants were mentioned; and, in imitation of Linnaeus, particular notice taken of the animals which fed upon them.

5089. *John Duke of Bedford* made the latest and most laborious efforts towards attaining a knowledge of the comparative value of all the British and some foreign grasses worth cultivating. The result is given in an appendix to Sir H. Davy's *Agricultural Chemistry*, and more at large in Sinclair's *Horius Gramineus Wolouensis*, 8vo. 2d edit. 1825, and as it is of considerable interest, we shall afterwards present an abstract.

5090. *With respect to the general culture of grasses*, though no department of agriculture is more simple in the execution, yet, from the nature of grasses, considerable judgment is required in the design. Though grasses abound in every soil and situation, yet, all the species do not abound in every soil and situation differently. On the contrary, no class of perfect plants are so absolute and unalterable in their choice in this respect. The creeping-rooted and stoloniferous grasses will grow readily on most soils; but the fibrous-rooted species, and especially the more delicate upland grasses, require particular attention as to the soil in which they are sown; for in many soils they will either not come up at all, or die away in a few years, and give way to the grasses which would naturally spring up in such a soil when left to a state of nature. Hence in sowing down lands for permanent pasture, it is a good method to make choice of those grasses which thrive best in adjoining and similarly-circumstanced pastures for a part of the seed; and to mix with these what are considered the very best kinds.

5091. *New and excellent varieties* of many of the grasses, especially, those used or fit to be used in the convertible husbandry, might no doubt be obtained by selection and cross breeding, and it is much to be wished that this were attempted by cultivators. — The grasses to be here treated of may be classed as tall sorts, or those best fitted for hay; and dwarf grasses, or those fit only for pasturage: those experimented on at Woburn will next be noticed.

SECT. I. Of the tall growing or Hay Grasses.

5092. *The hay grasses* for the purposes of agriculture may be advantageously divided into those of temporary, and those of permanent duration.

SUBJECT. 1. *Of tall or Hay Grasses of temporary Duration.*

5093. The most valuable of this division are the biennial, or, as it is commonly but erroneously called, the annual and subperennial rye-grass (fig. 580 a) the cock's-foot grass (b), and woolly soft grass (c). Where a crop of hay is desired within the year, it is necessary to resort to such grasses as are annuals in the strict sense of the word, and none can be better for this purpose than the common oat, cut and made into hay when it comes into flower. Next in order may be mentioned the other cereal grasses and the annual varieties of bromus; the latter, however, are very coarse grasses, though prolific in culm.

5094. The biennial rye-grass (*Lolium perenne*, var. *biennis*, L.) is well known, as being universally sown, either with or without clover, among corn crops, with a view to one crop of hay the succeeding season. It attains a greater height, and produces a longer, broader spike of flowers, than the perennial rye-grass, and the produce in hay is considered greater than that of any other annual grass, equally palatable to cattle. It prefers a rich loamy soil, but will grow on any surface whatever, not rock or undecayed bog.

5095. The perennial rye-grass (*Lolium perenne*, L. *Ivraie vivace*, Fr.; *Dauvende Lolche*, Ger.; and *Loglio vivace*, Ital.) differs from the other in being of somewhat smaller growth, and in abiding for several years, according to the variety and the soil and culture. Many consider this grass coarse, benty, and very exhausting to the soil; but after all the experiments that have been made on the other grasses, none have been found to equal it for a course of mowing and pasturing for two, three, or seven years. It is sown in Italy, and especially in Lombardy, and also in France and Germany, along with clover, for the same purposes as in this country; and, as Von Thier has remarked, though some have tried other species, both in these countries and in England, they have in the end returned to rye-grass. When intended as a pasture-grass, if stocked hard, and when for hay, if mown early, the objections to it are removed. (*Code of Agriculture*.) G. Sinclair says the circumstance of its producing abundance of seed, which is easily collected, and vegetates freely on any soil, its early perfection and abundant herbage the first year, which is much relished by cattle, are the merits which have upheld it to the present day, and will probably for some time to come continue it a favorite grass among farmers. But the lattermath is inconsiderable, the plant impoverishes the soil in a high degree if not cut before the seed ripens. When this is neglected, the field after midsummer exhibits only a brown surface of withered straws. Let the produce and nutritive powers of rye-grass be compared with those of the cock's-foot-grass, and it will be found inferior nearly in the proportion of 5 to 18; to meadow fox-tail of 5 to 12; and to meadow fescue of 5 to 17. (*Hort. Gram. Wob.* 2d edit. 215. and see § 5100.) In a subsequent page he observes, "The new varieties, however, of this species of grass, which have been discovered of late years, remove in a considerable degree the serious objections which applied to the common rye-grass" (*ib.* 412.) The varieties alluded to are all perennial, and as under:

Slender rye-grass, common in dry impoverished pasture land.

Compound or broad spikelet rye-grass, found in rich soils, long under grass, and chiefly in eastern parts, as east-ways, &c. It has a short broad spike, crowded with spikelets at the top.

Pacey's rye-grass, found in rich meadow lands, and introduced by Pacey, a cultivator in the uplands of Staffordshire; spike nearly upright, spikelets shorter than in the compound r. g. the stem furnished with long leaves, and the root leaves age and numerous. Sinclair considers this the most valuable variety of the rye-grass.

Whitworth's rye-grass, introduced by G. Whitworth, Esq.

All the above, excepting the two first, are excellent varieties. Pacey's and Russell's are considered the best.

5096. The proportional value which the grass at the time of flowering bears to that at the time the seed is ripe, is as 10 to 11. The proportional value which the grass of the lattermath bears to that at the time of flowering, is as 4 to 10, and to that at the time the seed is ripe, as 4 to 11.

5097. The seed of perennial rye-grass is not to be distinguished from that of the annual variety. It may be collected by hand, in most parts of Britain, from old pastures, and a considerable quantity is annually so got in Kent and Sussex. It is also grown purposely for seed in England and Scotland. Formerly it was the practice for farmers to collect the seed which dropped from the hay used by their horses; but rye-grass, grown for hay, is now cut by all judicious farmers, when it is just coming into flower; and therefore to collect the glumes or empty husks can be of no use as seed. It has also been a common practice, in regard to rye-grass, to let the mixed crop of that and clover stand till the seeds of the former have attained a considerable degree of ripeness, when it is cut down and made into hay, in the usual manner; and the seeds of the rye-grass are separated by the use of the flail, commonly before the hay is put into the field-ricks. Sometimes, when but a small quantity is wanted, the hay is merely shaken well upon a cloth, when it is



of Acre House, Lincolnshire, an eminent cultivator of the *Poa annua*, who, in 1825, had 60 varieties of *Lolium perenne* under experiment.

Sinclair's rye-grass, introduced by Sinclair of Haldenham. *Russell's rye-grass*, first cultivated by the late S. Holdich, Esq., Editor of *The Farmer's Journal*, from seed obtained of a plant in a rich fen pasture, pointed out to Holdich by the Duke of Bedford.

Church's bent, or *Church's bent-grass*, an excellent variety of rye-grass, cultivated in some parts of Berkshire.

building in the stack-yard; or afterwards in the stable-loft, before it is put into the horse's racks. But in all of these methods, in order to obtain good seed, the clover must remain uncut beyond the proper season; and it is thus materially injured in quality, while the value of the rye-grass seed, in such a crop, is merely a secondary consideration.

5098. When seed is the principal object of the culture of rye-grass, it ought not to be mixed with clover at all, though it may be sown along with any of the kinds of corn, and treated the year after in every respect as a crop of corn; bound up in sheaves, bulk in stacks, threshed with the flail, and dressed by the winnowing-machine in the same manner.

5099. The difficulty of distinguishing between the annual and perennial varieties of rye-grass has led to the practice, in some places, of cutting or pasturing the first year's crop, and taking a crop for seed the second year. If the growth of the rye-grass plants be close and vigorous the second year, there is reason to be satisfied that the seed is of the perennial variety; and though red clover has been sown with the rye-grass, a great part of it disappears by that time, and forms but a small portion of the second year's cutting. (*Sup. Encyc. Brit. art. Agr.*)

5100. The cock's-foot grass (*Dactylis glomerata*, L. fig. 580 b) is an imperfect perennial, and grows naturally on dry sandy soils. This grass may be known by its coarse appearance, both of the leaf and spike, and also by its whitish green hue. One writer says, he has cultivated it largely and to his satisfaction on wet loams on a clay marl bottom, upon which the finer grasses are apt to give way in a few years to the indigenous produce. If suffered to rise high, it is very coarse; but fed close, is a very valuable sheep pasture. He has sown two bushels an acre, and 10 lbs. common red clover; and when the clover wears out, the grass fills the lands and abides well in it. It grows well in winter. It has been found highly useful as an early sheep feed. It is early, hardy, and productive, but is a coarser plant than rye-grass, and requires even greater attention in regard to being cut soon, or fed close. It does best by itself, and the time of its ripening being different from that of clover, it does not suit well to be mixed with that plant. The pasturage it affords is luxuriant, and particularly agreeable to sheep. It is cultivated to a great extent, and with astonishing success at Holkham. The quantity of sheep kept upon it, summer and winter, is quite surprising; and the land becomes renovated by laying two or three years under this grass, and enriched by the manure derived from the sheep. A field, in the park at Woburn, was laid down in two equal parts, one part with rye-grass and white clover, and the other part with cock's-foot and red clover: from the spring till midsummer, the sheep kept almost constantly on the rye-grass; but after that time they left it, and adhered with equal constancy to the cock's-foot during the remainder of the season. In *The Code of Agriculture*, (p. 497. third edit.) it is stated that Sinclair, of Woburn, considers "no grass so well suited for all purposes as cock's-foot;" and in the second edition of *H. Gramineæ Woburnensis*, it is observed, that if one species only is thought preferable to another in the alternate husbandry, that species is the *Dactylis glomerata*, from its more numerous merits. But a certain supply of the most nutritious herbage throughout the season will be in vain looked for from any one species of grass, but only where nature has provided it in a combination of many. None appear better fitted for mixing with *Dactylis* than *Festuca duriuscula* and *pratensis*, *Poa trivialis*, *Holcus avenaceus*, *Phleum pratense*, *Lolium perenne*, and white clover. "A combination thus formed, of three parts cock's-foot, and one part of these species just mentioned, will secure the most productive and nutritive pasture in alternation with grain crops, on soils of the best quality; and even on soils of an inferior nature, under the circumstances of unfavorable seasons, will afford nutritive herbage, when otherwise the land would have been comparatively devoid of it, if one species of grass only had been employed." (*Hort. Gram. Wob. 2d edit. 414.*)

5101. The proportional value which the grass at the time of flowering bears to that at the time the seed is ripe, in as 5 to 7 nearly. The proportional value which the grass of the lattermath bears to that at the time of flowering, is as 6 to 10; and to that at the time the seed is ripe, as 6 to 14. Sixty-four dr. of the straws at the time of flowering afford of nutritive matter 1.2 dr. The leaves or lattermath, and the straws simply, are therefore of equal proportional value; a circumstance which will point out this grass to be more valuable for permanent pasture than for hay. The above details prove, that a loss of nearly one-third of the value of the crop is sustained, if it is left to the period when the seed is ripe, though the proportional value of the grass at that time is greater, i. e. as 7 to 5. The produce does not increase if the grass is left growing after the period of flowering, but uniformly decreases; and the loss of lattermath, (from the rapid growth of the foliage after the grass is cropped) is very considerable. These circumstances point out the necessity of keeping this grass closely cropped, either with the scythe or cattle, to reap the full benefit of its merits.

5102. The woolly soft grass (*Holcus lanatus*, L. fig. 580 c) is an imperfect perennial, and rather late flowering grass, of a soft unsubstantial appearance, and found chiefly in poor dry soils. It is, however, a very common grass, and grows on all soils, from the richest to the poorest. It affords abundance of seed, which is light, and easily dispersed by the wind. It was cultivated at Woburn on a strong clayey loam, and the proportional value which the grass at the time the seed is ripe, bears to that at the time of flowering, is as 11 to 12. Young, of Essex, observes of this grass, that it flourishes well on any moist soil, and should be sown chiefly with a view to sheep, for it is not equally good for other stock: many acres of it have been cultivated on his farm for sheep, and it has answered greatly when kept close fed. Marshall, in his *Midland Counties*, mentions it as a good grass for cows and other cattle, but bad for horses. In his *Rural Economy of Yorkshire*, he, however, condemns it in toto.

5103. According to Sinclair, of Woburn, "it appears to be generally disliked by all sorts of cattle. The produce is not so great as a view of it in the fields would indicate; but being left almost entirely untouched by cattle, it appears as the most productive part of the herbage. The hay which is made of it, from the number of downy hairs which cover the surface of the leaves, is soft and spongy, and disliked by cattle in general." The Woburn experiments lead to the conclusion that the *holcus mollis* is a better hay plant than the species here noticed; but as that is a more durable perennial it is less fitted for the temporary purposes of the grasses of this section.

5104. With respect to the culture of these grasses, it may be considered as the same as that given to rye-grass, as discussed when treating of clover and rye-grass (5002.). The seeds of all of them are sold by the principal seedsmen, or may be gathered on grass-fields, or hedge wastes, by women or children at an easy rate.

SUBJECT. 2. Of tall or Hay Grasses of permanent Duration.

5105. No permanent grass has been found equal to the rye-grass for the purposes of convertible husbandry, but others have been selected which are considered superior for hay meadows. The principal of these are the fescue, fox-tail, and meadow-grass. Agriculturists, indeed, are not all agreed on the comparative merits of these grasses with rye-grass, but there are none who do not consider it advisable to introduce a portion of each, or most of these species along with rye-grass, in laying down lands to permanent pasture. The nutritive products of these grasses, of perennial rye-grass, and of that singular grass florin, are thus given by Sir H. Davy :

Systematic name.	English name.	Whole quantity of soluble or nutritive matter.	Mucilage or starch.	Saccharine matter or sugar.	Gluten or albumen.	Extract or matter rendered insoluble during evaporation.
<i>Festuca loliaacea</i> (fig. 581 a)	Spiked fescue grass	19	15	2	—	2
<i>Holcus odoratus</i> -	Sweet-scented soft grass	82	72	4	—	6
<i>Anthoxanthum vernum</i> -	Sweet-scented vernal grass	50	43	4	—	3
<i>Alopecurus pratensis</i> (d)	Meadow fox-tail grass	33	24	3	—	6
<i>Poa fertilis</i> (c) -	Fertile meadow grass	78	65	6	—	7
trivialis (f) -	Roughish meadow grass	39	29	5	—	6
<i>Cynosurus cristatus</i> -	Crested dog's-tail grass	35	28	3	—	4
<i>Lolium perenne</i> -	Perennial rye-grass	30	26	4	—	5
<i>Agrostis stolonifera</i> -	Florin	54	46	5	1	2
	Florin cut in winter	78	64	8	1	3

581



5106. Of the fescue grass there are three species in the highest estimation as meadow hay grasses, viz. the meadow, tall, and spiked fescue. (fig. 581 a, b, c.) The *F. pratensis* (a), or the meadow or fertile fescue grass, is found in most rich meadows and pastures in England, and is highly grateful to every description of stock. It is more in demand for laying down meadows than any other species excepting the rye-grass. By the Woburn experiments, the value of this grass at the time the seed is ripe, is to that of the grass at the time of flowering, as 6 to 18. The loss which is sustained by leaving the crop of this grass till the seed be ripe is very great. That it loses more of its weight in drying at this stage of growth, than at the time of flowering, perfectly agrees with the deficiency of nutritive matter in the seed crop, in proportion to that in the flowering crop: the straws being succulent in the former, they constitute the greatest part of the weight; but in the latter they are comparatively withered and dry, consequently the leaves constitute the greatest part of the weight. It may be observed here, that there is a great difference between straws or leaves that have been dried after they were cut in a succulent state, and those which are dried by nature while growing. The former retain all their nutritive powers; but the latter, if completely dry, very little, if any.

5107. The tall or infertile fescue grass (*Festuca elatior*, E. B. d.) is closely allied to the *festuca pratensis*, from which it differs in little, except that it is larger in every respect. The produce is nearly three times that of the *F. pratensis*, and the nutritive powers of the grass are superior, in direct proportion, as 6 to 8. The proportional value which the grass at the time the seed is ripe, bears to that at the time of flowering, is as 12 to 20. The proportional value which the grass of the lattermath bears to that of the crop, is as 16 to 20; and to that at the time the seed is ripe, as 12 to 16 inverse. Curtis observes, that as the seeds of this plant, when cultivated, are not fertile, it can only be introduced by parting its roots and planting them out; in this there would, says he, be no great difficulty, provided it were likely to answer the expense,

which he is strongly of opinion it would in certain cases; indeed he has often thought that meadows would be best formed by planting out the roots of grasses, and other plants, in a regular manner; and that, however singular such a practice may appear at present, it will probably be adopted at some future period: this great advantage would, he says, attend it, noxious weeds might be more easily kept down, until the grasses and other plants had established themselves in the soil.

5108. *The spiked fescue grass*, or darnel fescue grass, (*Festuca loliacea*, L. c), resembles the rye-grass in appearance, and the tall fescue grass in the infertility of its seeds. It is considered as superior to rye-grass either for hay or permanent pasture, and improves in proportion to its age, which is the reverse of what takes place with the rye-grass.

5109. *The meadow fox-tail grass* (*Alopecurus pratensis*, d) is found in most meadows, and when the soil is neither very moist nor very dry, but in good heart, it is very productive. It also does well on water meadows. Sheep and horses seem to have a greater relish for this grass than oxen. In the Woburn experiments, it was tried both on a sandy loam and a clayey loam, and the result gave nearly three-fourths of produce greater from a clayey loam than from a sandy soil, and the grass from the latter is comparatively of less value, in proportion as 4 to 6. The straws produced by the sandy soil are deficient in number, and in every respect less than those from the clayey loam; which will account for the unequal quantities of the nutritive matter afforded by them; but the proportional value in which the grass of the lattermath exceeds that of the crop at the time of flowering, is as 4 to 3: a difference which appears extraordinary, when the quantity of flower-stalks which are in the grass at the time of flowering is considered. In the *anthoxanthum odoratum* the proportional difference between the grass of these crops is still greater, nearly as 4 to 9; in the *poa pratensis* they are equal; but in all the latter flowering grasses experimented upon, the flowering straws of which resemble those of the *alopecurus pratensis*, or *anthoxanthum odoratum* the greater proportional value is always, on the contrary, found in the grass of the flowering crop. Whatever the cause may be, it is evident that the loss sustained by taking the crops of these grasses at the time of flowering is considerable. The proportional value which the grass at the time of flowering bears to that at the time the seed is ripe, is as 6 to 9. The proportional value which the whole of the lattermath crop bears to that at the time the seed is ripe, is as 5 to 9, and to that at the time of flowering, proportionably as 13 to 24. Next to the fescue, this grass is in the greatest reputation for laying down mowing grounds; but it is unfortunately subject to the rust in some situations.

5110. Of the *meadow grass* there are two species in esteem as hay plants, the smooth-stalked, and roughish. These plants compose the greater part of the celebrated Orcheston meadows near Salisbury, and also of the meadows near Edinburgh.

5111. *The great or smooth-stalked meadow grass*, the spear grass of America, (*Poa pratensis*, c) is distinguished by its height, smooth stem, and creeping roots. According to Sole it is the best of all the grasses: its foliage begins to shoot and put on a fine verdure early in the spring, but not so soon as some other grasses. Every animal that eats grass is fond of it; while it makes the best hay, and affords the richest pasture. It abounds in the best meadows about Laycock and Chippenham, and has the valuable property of abiding in the same land, while most other grasses are continually changing. According to some it delights in rather a dry than a moist soil and situation, on which account it keeps its verdure better than most others in dry seasons; but it thrives most luxuriantly in rich meadows.

5112. By the *Woburn experiments*, the proportional value in which the grass of the lattermath exceeds that of the flowering crop, is as 6 to 7. The grass of the seed-crop, and that of the lattermath, are of equal value. This grass is, therefore, of least value at the time the seed is ripe; a loss of more than one-fourth of the value of the whole crop is sustained if it is not cut till that period: the straws are then dry, and the root-leaves in a sickly decaying state: those of the lattermath, on the contrary, are luxuriant and healthy. This species sends forth flower-stalks but once in a season, and those being the most valuable part of the plant for the purpose of hay, it will, from this circumstance, and the superior value of the grass of the lattermath, compared to that of the seed-crop, appear well adapted for permanent pasture. It was of this grass that the American prize bonnet, in imitation of Leghorn, was manufactured by Miss Woodhouse.

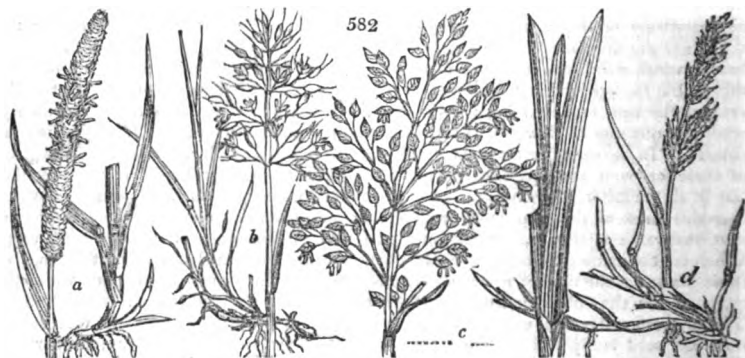
5113. *The roughish meadow grass* (*Poa trivialis*, L. f) delights in moist, rich, and sheltered situations, when it grows two feet high, and is very productive. By the Woburn experiments, it appears that the proportional value in which the grass of the seed-crop exceeds that at the time of flowering, is as 8 to 11. The proportional value by which the grass of the lattermath exceeds that of the flowering crop, is as 8 to 12, and that of the seed crop as 11 to 12. Here then is a satisfactory proof of the superior value of the crop at the time the seed is ripe, and of the consequent loss sustained by taking it when in flower; the produce of each crop being nearly equal. The deficiency of hay in the flowering crop, in proportion to that of the seed crop, is very striking. Its superior produce, the highly nutritive powers which the grass seems to possess, and the season in which it arrives at perfection, are merits which distinguish it as one of the most valuable of those grasses, which affect moist rich soils, and sheltered situations; but on

dry exposed situations, it is altogether inconsiderable; it yearly diminishes, and ultimately dies off, not unfrequently in the space of four or five years.

5114. The above are *six of the best British grasses*, for either dry or watered meadows. The seeds of the meadow fescue, fox-tail, and smooth and rough meadow grass, may be had from the seedsmen, and they are sown in various proportions with the clovers and rye-grass. The seeds of the two sorts of meadow grass are apt to stick together, and require to be well mixed with the others before being sown. The tall and spiked fescue grass, having a number of barren flowers, are not prolific in seeds, and they are therefore seldom to be got at the seed shops; though they may occasionally be had there gathered from plants in a wild state.

5115. As *hay grasses*, adapted for particular soils and situations, the cat's-tail or Timothy, floating fescue, and florin grass, have been recommended; but it cannot be said that the opinions of cultivators are unanimous in their favor.

5116. The cat's-tail, or Timothy grass, (*Phleum pratense*, L. fig. 582 a) is a native plant,



and found both in dry and moist soils. It was first brought into notice by Timothy Hudson, about 1780, who introduced it from Carolina, where it was in great repute. On moist rich soils it is a prolific grass, but late; on dry soils it is good for little, and for cultivation in any way is disapproved of by Withering, Swaine, Curtis, and others, as having no properties in which it is not greatly surpassed by the *alopecurus pratensis*. The Woburn experiments, however, present this grass as one of the most prolific for hay. The nutritive matter afforded by 64 drachms of the straws, was 7 drachms. The nutritive powers of the straws simply, therefore, exceed those of the leaves, in proportion as 28 to 8; and the grass, at the time of flowering, to that at the time the seed is ripe, as 10 to 28; and the lattermath, to the grass of the flowering crop, as 8 to 10. The comparative merits of this grass will appear from the above particulars to be very great; to which may be added the abundance of fine foliage that it produces early in the spring. In this respect it is inferior to the *poa fertilis*, and *poa angustifolia* only. The value of the straws at the time the seed is ripe, exceeds that of the grass at the time of flowering, as 28 to 10, a circumstance which increases its value above many others; for by this property its valuable early foliage may be cropped, to an advanced period of the season, without injury to the crop of hay, which in other grasses which send forth their flowering straws early in the season would cause a loss of nearly one half of the value of the crop, as is clearly proved by former examples; and this property of the straws makes the plant peculiarly valuable for the purpose of hay.

5117. The floating fescue grass, (*Festuca fluviatilis*, b) is found in rich swamps, especially in Cambridgeshire, where it is said to give the peculiar flavor to Cottenham and Cheddar cheese. It is also found in ditches and ponds in most parts of the country. It is greedily devoured by every description of stock, not excepting hogs and ducks, and geese eagerly devour the seeds, which are small, but very sweet and nourishing. They are collected in several parts of Germany and Poland, under the name of Manna-seeds (*Schwaden*), and are esteemed a delicacy in soups and gruels. When ground to meal, they make bread very little inferior to that from wheat. The bran is given to horses that have the worms; but they must be kept from water for some hours afterwards. Geese, and other water-fowl, are very fond of the seeds. So also are fish; trout, in particular, thrive in those rivers where this grass grows in plenty. It has been recommended to be sowed on meadows that admit flooding; but Curtis justly remarks, that the floating fescue will not flourish except in land that is constantly under water, or converted into a bog or swamp.

5118. The water meadow grass, (*Poa aquatica*, c) is found chiefly in marshes, but

will grow on strong clays, and yield, as the Woburn experiments prove, a prodigious produce, flowering from June to September. It is one of the largest of our grasses. In the fens of Cambridgeshire, Lincolnshire, &c. immense tracts, that used to be overflowed, and produce useless aquatic plants, and though drained by mills, still retain much moisture, are covered with this grass, which not only affords rich pasturage in summer, but forms the chief part of their winter fodder. It has a powerfully creeping root; and bears frequent mowing well. It is sometimes cut thrice in one season near the Thames. It grows not only in very moist ground, but in the water itself; and with cat's-tail, burr-reed, &c. soon fills up ditches, and occasions them to require frequent cleansing. In this respect it is a formidable plant, even in slow rivers. In the Isle of Ely they cleanse these by an instrument called a *bea*, which is an iron roller, with a number of pieces of iron, like small spades, fixed to it; this is drawn up and down the river by horses walking along the bank, and tears up the plants by the roots, which float, and are carried down the stream. The grass was, however, cultivated at Woburn on a strong tenacious clay, and yielded considerable produce.

5119. *The florin grass (Agrostis stolonifera, d)* is a very common grass both in wet and dry, rich and poor situations. Few plants appear to be more under the influence of local circumstances than this grass. On dry soils it is worth nothing; but on rich marl soils, and in a moist soil, if we may put confidence in the accounts given of its produce in Ireland, it is the most valuable of all herbage plants. It was first brought into notice by Dr. Richardson, in 1809, and subsequently extolled, and its culture detailed in various pamphlets by the same gentleman. It appears to be exclusively adapted for moist peat soils or bogs. In *The Code of Agriculture*, it is said, "On mere bogs, the florin yields a great weight of herbage, and is, perhaps, the most useful plant that bogs can produce." According to Sir H. Davy, the florin grass, to be in perfection, requires a moist climate or a wet soil; and it grows luxuriantly in cold clays unfitted for other grasses. In light sands, and in dry situations, its produce is much inferior as to quantity and quality. He saw four square yards of florin grass cut in the end of January, in a meadow exclusively appropriated to the cultivation of florin, by the Countess of Hardwicke, the soil of which is a damp stiff clay. They afforded twenty-eight pounds of fodder, of which one thousand parts afforded sixty-four parts of nutritive matter, consisting nearly of one-sixth of sugar, and five-sixths of mucilage, with a little extractive matter. In another experiment, four square yards gave twenty-seven pounds of grass. Lady Hardwicke has given an account of a trial of this grass; wherein twenty-three milch cows, and one young horse, besides a number of pigs, were kept a fortnight on the produce of one acre. On the Duke of Bedford's farm, at Maulden, florin hay was placed in the racks before horses, in small distinct quantities, alternately with common hay; but no decided preference for either was manifested by the horses in this trial.

5120. There are other species of *agrostis*, as the *A. palustris* and *repens*, and some varieties of the *A. stolonifera*, that on common soils are little different in their appearance and properties from florin. Of one of these, the narrow-leaved creeping bent (*A. stolonifera*, var. *angustifolia*), the following remarks are made in the account of the Woburn experiments. "From a careful examination of the creeping-bent with narrow leaves, it will doubtless appear to possess merits well worthy of attention, though perhaps not so great as has been supposed, if the natural place of its growth and habits be impartially taken into the account. From the couchant nature of this grass, it is denominated couch-grass, by practical men, and from the length of time that it retains the vital power, after being taken out of the soil, it is called squitch, quick, full of life, &c.

5121. *The culture of florin* is different from that of other grasses. Though the plant will ripen its seeds on a dry soil, and these seeds being very small, a few pounds would be sufficient for an acre, yet it is generally propagated by stolones or root-shoots. The ground being well pulverised, freed from weeds, and laid into such beds or ridges as the cultivator may think advisable; small drills an inch or two deep, and six or nine inches asunder, are to be drawn along its surface, with a hand or horse-hoe, or on soft lands by the hoe-rake. In the bottom of these drills, the florin shoots (whether long or short is of no consequence) are laid in lengthways, so as their ends may touch each other, and then lightly covered with a rake, and the surface rolled to render it fit for the scythe. In six months the whole surface will be covered with verdure, and if the planting be performed early in spring, a large crop may be had the same autumn. Any season will answer for planting, but one likely to be followed by showers and heat is to be preferred. Those who wish to cultivate this grass will consult Dr. Richardson's *New Essay on Florin Grass* (1813), and also *The Farmer's Magazine* for 1810-14. Our opinion is, that neither florin, Timothy, or floating fescue, are ever likely to be cultivated in Britain; though the two last may perhaps succeed well on the bogs and moist rich soils of Ireland, where, to second the influence of the soil, there is a moist warm climate.

5122. A number of other species of tall grasses, well adapted for meadows and hay-making, might be here enumerated; but we have deemed it better to treat only of the most popular sorts, of which seeds may be purchased, all the others of any consequence will be found in a tabular view (Sect. III.), accompanied by a summary statement of their products, in hay and aftermath, nutritive matter, and general character.

5123. *The preparation of the soil, and sowing of the usual meadow grasses*, differs in nothing from that of clover and rye-grass already given; the after treatment of dry meadows, including the making of natural hay, will be found in the succeeding Chapter on the management of grass-lands, and that of watered meadows was naturally given when treating of their formation. (4053.)

SECT. II. Grasses chiefly adapted for Pasturage.

5124. Of *pasturage grasses* we shall make a selection of such as have been tried to some extent, and of which the seeds are in the course of commerce. On soils in good condition, and naturally well constituted, no better grasses can be sown for pasturage than those we have described as tall grasses for hay-meadows; but for early and late pasturage, and secondary soils, there are others much more suitable.

5125. The *pasture grasses for early pasturage on all soils*, are the *anthoxanthum odoratum*, *holcus odoratus*, *avena pubescens*, and *poa annua*.

5126. The *pasture grasses for late herbage on all soils* are chiefly the different species of *agrostis* and *phleum*.

5127. The *pasture grasses for poor or secondary soils* are the *cynosurus cristatus*, *festuca duriuscula* and *ovina*, *poa compressa*, *cristata*, and *angustifolia*.

5128. The *grasses that afford most nutritive matter in early spring*, are the fox-tail grass and the vernal grass; the former has been already mentioned as one of the best hay-grasses.

5129. The *sweet-scented vernal grass*, (*Anthoxanthum odoratum*, fig. 583 a), is common



in almost all pastures, and is that which gives the fragrance to natural or meadow-hay. It is chiefly valuable as an early grass, as, though it is eaten by stock, it does not appear to be much relished by them. From the Woburn experiments, it appears that the smallness of the produce of this grass renders it improper for the purpose of hay; but its early growth, and the superior quantity of nutritive matter which the lattermath affords, compared with the quantity afforded by the grass at the time of flowering, causes it to rank high as a pasture-grass, on such soils as are well fitted for its growth; such are peat-bogs, and lands that are deep and moist.

5130. The *downy oat grass*, (*Avena pubescens*, b), according to the Woburn experiments, possesses several good qualities, which recommend it to particular notice; it is hardy, early, and more productive than many others which affect similar soils and situations. Its growth after being cropped is tolerably rapid, although it does not attain to a great length if left growing; like the *poa pratensis* it sends forth flower-stalks but once in a season, and it appears well calculated for permanent pasture on rich light soils.

5131. The *annual meadow grass* (*Poa annua*, c), is the most common of all grasses, and the least absolute in its habits. It is almost the only grass that will grow in towns and near works where the smoke of coal abounds. Though an annual grass, it is found in most meadows and pastures perpetually flowering, and affording an early sweet herbage, relished by all stock, and of as great importance to birds as wheat is to man. It hardly requires to be sown, as it springs up every where of itself. However, it may not be amiss to sow a few pounds of it per acre wherever perpetual pasture (not hay) is the object.

5132. The *fine bent grass* (*Agrostis vulgaris*, d), is one of the most common grasses, and according to the Woburn experiments, one of the earliest. The *A. palustris* is nearly as early in producing its foliage, though both flower late, and neither are very prolific either in bulk or nutritive matter.

5133. The *narrow-leaved meadow grass* (*Poa angustifolia*, e), though it flowers exp, yet is remarkable for the early growth of the leaves. According to the Woburn experiments the leaves attain to the length of more than twelve inches before the middle of April, and are soft and succulent; in May, however, when the flower-stalks make their appearance, it is subject to the disease termed rust, which affects the whole plant; the consequence of which is manifest in the great deficiency of produce in the crop at the time the seed is ripe, being one half less than at the time of the flowering of the

grass. Though this disease begins in the straws, the leaves suffer most from its effects, being at the time the seed is ripe completely dried up: the straws, therefore, constitute the principal part of the crop for mowing, and they contain more nutritive matter in proportion than the leaves. This grass is evidently most valuable for permanent pasture, for which, in consequence of its superior, rapid, and early growth, and the disease beginning at the straws, nature seems to have designed it. The grasses which approach nearest to this in respect of early produce of leaves, are the *poa fertilis*, *dactylis glomerata*, *phleum pratense*, *alopecurus pratensis*, *avena elatior*, and *bromus littoreus*, all grasses of a coarser kind.

5134. *The best natural pastures of England, examined carefully during various periods of the season, were found by Sinclair, of Woburn, to consist of the following plants:—*

Alopecurus pratensis.
Dactylis glomerata.
Festuca pratensis.
Phleum pratense.

Anthoxanthum odoratum.
Holcus avenaceus.
Vicia sepium.
Lolium perenne.

Bromus arvensis (frequent.)
Poa annua.
Avena pratensis.

These afford the principal grass in the spring, and also a great part of the summer produce.

Avena flavescens.
Hordium pratense.
Cynosurus cristatus.
Festuca duriuscula.

Poa trivialis.
Poa pratensis.
Holcus lanatus.
Trifolium pratense.

Trifolium repens.
Lathyrus pratensis.
Festuca duriuscula.

These yield produce principally in summer and autumn.

Achillea millefolium.

Agrostis stolonifera and *palustris.*

Triticum repens.

These vegetate with most vigor in autumn.

Ranunculus acris.

Plantago lanceolata.

Rumex acetosa.

The first and last of these plants are to be considered as injurious; and the other is of little value as herbage. (*Hort. Gram. Wob. 2d edit. 133.*)

5135. *The above mixture sown at the rate of four or five bushels to the acre, on well prepared soil without corn or other crop of any kind, could hardly fail of producing excellent pasture the following year, and for an endless period. The best time for sowing is July or August, as spring sown seeds are apt to suffer with the droughts of June and July. Fifteen of the above sorts are to be had from the seed shops; and all of them may be gathered from natural pastures, or bespoke from collectors. Sinclair, of Woburn, having entered into the seed and nursery business, and having expressed his intention to devote his particular attention to supplying the public with grass and other agricultural seeds, will probably render such seeds more common in commerce. (Advt. by Cormack, Son and Sinclair.)*

5136. *Of late pasture grasses the different species of cat's-tail (Phleum), and bent-grass (Agrostis), are the chief, and especially the Timothy and florin-grass. The grasses, Sir H. Davy observes, that propagate themselves by stolones, the different species of agrostis, supply pasture throughout the year; and the concrete sap, stored up in their joints, renders them a good food even in winter.*

5137. *Of pasture grasses for inferior soils one of the most durable is the dog's-tail grass (Cynosurus cristatus, fig. 584 a). This is a very common grass on dry, clayey, or firm*



surfaces. It is one of the best grasses for parks, being highly relished by the South Down sheep and deer.

5138. *The hard fescue grass (Festuca duriuscula, b), is one of the best of the dwarf sorts of grasses. It is grateful to all kinds of cattle; hares are very fond of it; at Woburn they crop it close to the roots, and neglect the festuca ovina, and festuca rubra, which grow contiguous to it. It is present in most good meadows and pastures, and with F. ovina is the best for lawns.*

5139. *The festuca glabra (c), and hordiformis (d), greatly resemble the hard fescue, and may be considered as equally desirable as pasture and lawn grasses.*

5140. *The yellow oat grass (Avena flavescens), is very generally cultivated, and appears, from the Woburn experiments, to be a very valuable grass for pasture on a clayey soil.*

5141. *Of pasture grasses for inferior soils and upland situations, one of the principal is the festuca ovina, or sheep's fescue grass (fig. 585 a)* This grass is peculiarly adapted for hilly sheep pastures. It is a very dwarf grass, but relished by all kinds of cattle. According to Sinclair's experience, "on dry soils that are incapable of producing the larger sorts, this should form the principal crop, or rather the whole; for it is seldom or ever, in its natural state, found intimately mixed with others, but by itself.



5142. *The Poa alpina (b), Alopecurus alpinus, and Aira caespitosa (c), Briza media (d), and minima, and Agrostis humilis and vulgaris, are all dwarf mountain grasses, well adapted for hilly parks or lawns.*

5143. *On the culture of these grasses it is unnecessary to enlarge, as it must obviously be the same as that of rye-grass or any of the others.* The chief difficulty is to get the seed in sufficient quantity, for which a good mode is to contract with a seedsman for the quantity wanted a year before hand. With all the pasture grasses, excepting the last class, we should recommend at least half the seed used to be that of the perennial rye-grass; and we think it should also form a considerable part of the seeds used in laying down all meadows, excepting those for the aquatic or stoloniferous grasses. These, if they thrive, are sure to choke and destroy it, and therefore neither rye-grass, or any other grass, should ever be sown with Timothy grass or florin.

5144. *The formation of grassy surfaces by distributing pieces of turf over them, has long been practised in gardening, in levelling down raised, or filling up hollow fences, and in other cases of partially altering a grassy surface; it is said to have been first used in agriculture by Whitworth, of Acre-house, Lincolnshire, and in 1812 it was brought forward on a large scale by John Blomfield, of Warham, in Norfolk, a tenant of Coke's. Blomfield planted eleven acres in this way. An account of the process, which is styled transplanting turf, or inoculating land with grass, has been published by Francis Blaikie, Coke's steward. (On the Conversion of Arable Land into Pasture, 12mo. 1817.)*

5145. *An abstract of the process of transplanting turf, and an opinion on it, are thus given in The Code of Agriculture.* A piece of good, clean, sweet old turf, which ought principally to consist of fibrous rooted plants, is cut into small pieces of about three inches square, and placed about six inches apart on the surface of ground pressed for that purpose. In this way one acre of turf will plant nine acres of arable land. The pieces of flag should be carefully placed with the grass side uppermost, and the plants pressed well into the ground. No more turf should be cut, carried, and spread in any one day than is likely to be planted before night. If the transplanted turf is found deficient in any particular species of favorite plants, as white clover, permanent red clover, &c. the seeds of those plants should be sown upon the young pasture in April. When the ground is in proper temper (between wet and dry) the pasture should be frequently well pressed down by heavy rollers, which will cause the plants to extend themselves along the ground rather than rise into tufts, which otherwise they would be apt to do. No stock should be permitted to feed upon the transplanted pasture in the first spring or summer, nor until the grasses have perfected and shed their seeds. Indeed the pasturing should be very moderate until the mother grass-plants and their young progeny have united and formed a compact turf. The expense of this operation is about 22. 10s. per statute acre; without making any allowance for the charges incurred by summer fallowing the arable land on which the turf has been transplanted; nor for the year's rent, poor's rates, and taxes for that year; nor for restoring the land whence the turf plants were taken, to its previous state. This plan seems to be well calculated to promote the improvement of light soils, not naturally of a grassy nature, for the grasses and their roots being once formed on a rich soil, will probably thrive afterwards even on a poor one, as they will derive a considerable proportion of their nourishment from the atmosphere. For light and gravelly soils, therefore, where permanent pasture is desirable, the plan cannot be too strongly recommended; and if it were found to answer on peat, after the surface was pared for the reception of the plants, and burnt to promote their growth, it would be a most valuable acquisition to sheep farmers in many districts of the country. Thus far Sir John Sinclair, but from facts related by Sinclair of Woburn, it appears to be a plan of little or no merit, only brought into notice by its novelty. (*H. G. Wob. 2d edit. 420, 421.*)

SECT. III. *General View of the Produce, Uses, Character, and Value of the principal British Grasses, according to the result of John Duke of Bedford's Experiments at Woburn.*

5146. *In all permanent pastures, Sir H. Davy observes, nature has provided a mixture of various grasses, the produce of which differs at different seasons.* Where pastures are to be made artificially, such a mixture ought to be imitated; and, perhaps, pastures superior to the natural ones may be made by selecting due proportions of those species of grasses fitted for the soil, which afford respectively the greatest quantities of spring, summer, lattermath, and winter produce; a reference to the results of the Woburn experiments, he adds, will show that such a plan of cultivation is very practicable.

5147. *The manner in which these experiments were conducted is thus described.* "Spots of ground, each containing four square feet, in the garden at Woburn Abbey, were enclosed by boards in such a manner that there was no lateral communication between the earth included by the boards, and that of the garden. The soil was removed in these enclosures, and new soils supplied; or mixtures of soils were made

is them, to furnish as far as possible to the different grasses those soils which seem most favorable to their growth; a few varieties being adopted for the purpose of ascertaining the effect of different soils on the same plant. The grasses were either planted or sown, and their produce cut and collected, and dried at the proper seasons, in summer and autumn, by Sinclair, his Grace's gardener. For the purpose of determining, as far as possible, the nutritive powers of the different species, equal weights of the dry grasses or vegetable substances were acted upon by hot water till all their soluble parts were dissolved; the solution was then evaporated to dryness by a gentle heat in a proper stove, and the matter obtained carefully weighed. This part of the process was likewise conducted with much address and intelligence by Sinclair, by whom all the following details and calculations are furnished. The dry extracts supposed to contain the nutritive matter of the grasses, were sent to me for chemical examination. The composition of some of them is stated minutely; but it will be found from the general conclusions, that the mode of determining the nutritive power of the grasses, by the quantity of matter they contain soluble in water, is sufficiently accurate for all the purposes of agricultural investigation." (*Agr. Chem. opp.*)

5148. *The leading results of these experiments* we have endeavored to present in a tabular view; farther details will be found in the paragraphs (antecedent and posterior) referred to in the first column. On the other columns of the table, it may be observed, that the height is given more by a guess than measurement, and after the appearance of the plants in a state of nature or medium soils. It is to be regretted, that the height of the plants at Woburn, were not included in the published details. The time of flowering is given, as it took place at Woburn, on which it is observed, that "to decide positively the exact period or season, when a grass always comes into flower, and perfects its seed, will be found impracticable; for a variety of circumstances interfere. Each species seems to possess a peculiar life in which various periods may be distinctly marked, according to the varieties of its age, of the seasons, soils, exposures, and mode of culture."

5149. *The soils, as denominated in the column devoted to them, are thus described.* 1st, By loam, is meant any of the earths combined with decayed animal, or vegetable matter. 2nd, Clayey loam, when the greatest proportion is clay. 3d, Sandy loam, when the greatest proportion is sand. 4th, Brown loam, when the greatest proportion consists of decayed vegetable matter. 5th, Rich black loam, when sand, clay, animal, and vegetable matters are combined in unequal proportions, the clay greatly divided, being in the least proportion, and the sand and vegetable matter in the greatest. The terms light sandy soil, light brown loam, &c. are varieties of the above, as expressed. The abbreviations of the names of books and native soils, will be found in common with all the other abbreviations used in this work explained in the General Index.

5150. *On the nutritive products*, Sir H. Davy has the following valuable remarks, some of which on the operations in the animal economy of the different substances, composing the nutritive matter, the agriculturist will find useful, as applied to the tables before given (4598. 4738, &c.) of the nutritive products of the corns, legumes, and roots. The only substances which Sir H. Davy detected in the soluble matters procured from the grasses, are mucilage, sugar, bitter extract, a substance analogous to albumen, and different saline matters. Some of the products from the aftermath crops, gave feeble indications of the tanning principle. In the experiments made on the quantity of nutritive matter in the grasses, cut at the time the seed was ripe, the seeds were always separated: and the calculations of nutritive matter made from grass and not hay.

5151. *The order in which these substances are nutritive*, is thus given: "The albumen, sugar, and mucilage, probably when cattle feed on grass or hay, are for the most part retained in the body of the animal; and the bitter principle, extract, saline matter, and tanning, when any exist, probably for the most part are voided in the excrement, with the woody fibre. The extractive matter obtained by boiling the fresh dung of cows, is extremely similar in chemical characters to that existing in the soluble products from the grasses. And some extract, obtained by Sinclair from the dung of sheep and of deer, which had been feeding upon the lolium perenne, dactylis glomerata, and trifolium repens, had qualities so analogous to those of the extractive matters obtained from the leaves of the grasses, that they might be mistaken for each other. The extract of the dung, after being kept for some weeks, had still the odor of hay. Suspecting that some undigested grass might have remained in the dung, which might have furnished mucilage and sugar, as well as bitter extract, I examined the soluble matter very carefully for these substances. It did not yield an atom of sugar, and scarcely a sensible quantity of mucilage." Sinclair, in comparing the quantities of soluble matter afforded by the mixed leaves of the lolium perenne, dactylis glomerata, and trifolium repens, and that obtained from the dung of cattle fed upon them, found their relative proportions, as 50 to 13.

5152. *From these facts it appears probable* that the bitter extract, though soluble in a large quantity of water, is very little nutritive; but probably it serves the purpose of preventing, to a certain extent, the fermentation of the other vegetable matters, or in modifying or assisting the function of digestion, and may thus be of considerable use in forming a constituent part of the food of animals. A small quantity of bitter extract and saline matter is probably all that is needed, and beyond this quantity the soluble matters must be more nutritive in proportion as they contain more albumen, sugar, and mucilage; and less nutritive in proportion as they contain other substances.

5153. *In comparing the composition of the soluble products afforded by different crops* from the same grass, Sir H. Davy found, in all the trials, the largest quantity of truly nutritive matter, in the crop cut when the seed was ripe, and least bitter extract and saline matter; most extract and saline matter in the autumnal crop; and most saccharine matter in proportion to the other ingredients, in the crop cut at the time of flowering.

5154. *The greater proportion of leaves in the spring*, and particularly in the late autumnal crop, accounts for the difference in the quantity of extract; and the inferiority of the comparative quantity of sugar in the summer crop, probably depends upon the agency of light, which tends always in plants to convert saccharine matter into mucilage or starch. Amongst the soluble matters afforded by the different grasses, that of the elymus arenarius (*fig. 543 a.*) was remarkable for the quantity of saccharine matter it contained, amounting to more than one-third of its weight. The soluble matters from the different species of festuca, in general afforded more bitter extractive matter, than those from the different species of poa. The nutritive matter from the seed crop of the poa compressa was almost pure mucilage. The soluble matter of the seed crop of phleum pratense, or meadow cat's-tail, afforded more sugar than any of the poa or festuca species. The soluble parts of the seed crop of the holcus mollis, and holcus lanatus, contained no bitter extract, and consisted entirely of mucilage and sugar. Those of the holcus odoratus afforded bitter extract, and a peculiar substance having an acrid taste, more soluble in alcohol than in water. All the soluble extracts of those grasses, that are most liked by cattle, have either a saline or subacid taste; that of the holcus lanatus is similar in taste to gum arabic. Probably the holcus lanatus, which is so common a grass in meadows, might be made palatable to cattle by being sprinkled over with salt.

5155. *No difference was found in the nutritive produce of the crops of the different grasses cut at the same season*, which would render it possible to establish a scale of their nutritive powers; but probably the soluble matters of the aftermath crop are always from one-sixth to one-third less nutritive, than those from the flower or seed crop. In the aftermath the extractive and saline matters are certainly usually in excess; but the aftermath hay mixed with summer hay, particularly that in which the fox-tail and soft grasses are abundant, would produce an excellent food.

5156.

Table of the Grasses experimented on at

References to further Details and Remarks.	Systematic Name and Authority.	English Name and Native Country.	Where figured or described.	Natural Duration.	Height in a wild state in inches.	Time of flowering at Woburn.	Time of ripening the Seed at Woburn.	Soil at Woburn.	Natural Soil and Situation as in Smith's Flora Brit.
5157.	<i>Anthoxanthum odoratum</i> , L.	Sweet-scented vernal grass, Brit.	E. B. 647	Peren.	12	April 29.	June 21.	Brown sandy loam	Meadows
5158	<i>Holcus odoratus</i> , Host. G. A.	Sweet-scented soft grass, Ger.	Host. N.A.	Peren.	14	April 29.	June 25.	Rich sandy soil	Woods, moist meadows
5159.	<i>Cynosurus cereuleus</i> , E. B.	Blue morning grass, Brit.	E. B. 1613	Peren.	90	April 30.	June 20.	Light sandy soil	Pastures
5142.	<i>Alopecurus alpinus</i> , E. B.	Alpine foxtail grass, Scot.	E. B. 1126	Peren.	6	May 20.	June 24.	Sandy loam	Scotch mountains
5109.	<i>Alopecurus pratensis</i> , E. B.	Alpine meadow grass, Scot.	E. B. 1005	Peren.	6	May 30.	June 30.	Light sandy loam	Scotch Alps
5111.	<i>Poa pratensis</i> , E. B.	Meadow foxtail grass, Brit.	E. B. 848	Peren.	24	May 30.	June 24.	{ Clayey loam Sandy loam	Meadows
5161.	<i>Poa cerulea</i> , var. <i>pratensis</i> , E. B.	Smooth-stalked meadow grass, Brit.	E. B. 1073	Peren.	18	May 30.	July 14.	Bog earth and clay	Mead. & pastures
5160.	<i>Avena pubescens</i> , E. B.	Short blueish meadow grass, Brit.	E. B. 1004	Peren.	14	May 30.	July 14.	Bog earth and clay	Meadows
5162.	<i>Avena pubescens</i> , E. B.	Downy oat grass, Brit.	—	Peren.	18	June 13.	July 8.	Rich sandy soil	Chalky pastures
5163.	<i>Avena horridiformis</i> , H. C.	Barley-like fescue grass, Hungary	—	Peren.	18	June 13.	July 10.	Manured sandy soil	Con fields
5115.	<i>Poa trivialis</i> , E. B.	Rough-headed oat gr. Brit.	E. B. 1072	Peren.	20	June 13.	July 10.	Man. light br. loam	Meadows
5163.	<i>Festuca glabra</i> , Curtis	Glaucous fescue gr. Brit.	—	Peren.	12	June 13.	July 10.	Brown loam	Chalky pastures
5164.	<i>Festuca glabra</i> , Wither.	Smooth fescue gr. Scot.	—	Peren.	9	June 16.	July 10.	Clayey loam	Mountains
5165.	<i>Festuca rubra</i> , Wither.	Purple fescue grass, Brit.	E. B. 585.	Peren.	12	June 20.	July 10.	Light sandy soil	Mead. & pastures
5166.	<i>Festuca ovina</i> , E. B.	Sheep's fescue gr. Brit.	E. B. 340.	Peren.	6	June 24.	July 10.	—	Dry pastures
5100.	<i>Briza media</i> , E. B.	Common quaking gr. Brit.	E. B. 340.	Peren.	16	June 24.	July 10.	Rich brown loam	Pastures
5171.	<i>Dactylis glomerata</i> , E. B.	Sheep-head, cock's-foot grass, Brit.	E. B. 353.	Peren.	24	June 24.	July 14.	Rich sandy loam	Soft moist soils
5167.	<i>Bromus tectorum</i> , Host. G. A.	Nodding pencilled brome grass, Eur.	—	Annual	12	June 24.	July 16.	Light sandy soil	Hedges
5168.	<i>Festuca cambrica</i> , Huda.	Cambridge fescue gr. Brit.	E. B. 1006	Annual	14	June 28.	July 16.	Light sandy soil	Dry pastures
5169.	<i>Bromus diandrus</i> , E. B.	Upright brome grass, Brit.	—	Annual	18	June 28.	July 16.	Rich brown loam	Con fields
5170.	<i>Poa angustifolia</i> , With.	Narrow-lea. meadow gr. Brit.	—	Peren.	24	June 28.	July 16.	Brown loam	Meadows
5169.	<i>Avena elatior</i> , Curtis	Tall oat grass or Knot grass, Brit.	E. B. 813	Peren.	50	June 28.	July 16.	—	Arable lands
5171.	<i>Poa elatior</i> , Curtis	Tall meadow grass, Scot.	—	Peren.	30	June 28.	July 16.	Rich clay loam	Meadows
5172.	<i>Avena elatior</i> , var. <i>durisscula</i> , E. B.	Hard fescue grass, Brit.	E. B. 470	Peren.	12	July 1.	—	Light sandy loam	Pastures
5173.	<i>Bromus erectus</i> , E. B.	Upright peren. br. gr. Brit.	E. B. 471	Peren.	36	—	—	Rich sandy soil	Chalky pastures
5175.	<i>Milium effusum</i> , E. B.	Common millet grass, Brit.	E. B. 1106	Peren.	40	July 1.	—	Light sandy soil	Woods
5106.	<i>Festuca pratensis</i> , E. B.	Meadow fescue grass, Brit.	E. B. 1592	Peren.	30	July 1.	—	Bog soil & coal ashes	Meadows
5095.	<i>Lolium perenne</i> , E. B.	Perennial rye grass, Brit.	E. B. 1592	Peren.	24	July 1.	—	Rich brown loam	Loamy pastures
5174.	<i>Festuca myuros</i> , E. B.	Wall fescue grass, Brit.	E. B. 1140	Peren.	24	July 1.	—	Clayey loam	Meadows
5177.	<i>Festuca lolica</i> , E. B.	Spiked fescue grass, Brit.	E. B. 1821	Peren.	36	July 1.	—	Rich brown loam	Moist pastures
5137.	<i>Aira cristata</i> , E. B.	Crested hair grass, Brit.	E. B. 648	Peren.	9	July 4.	—	Sandy loam	Sandy pastures
5175.	<i>Cynosurus cristatus</i> , E. B.	Crested dog's-tail gr. Brit.	E. B. 516	Peren.	24	July 6.	—	Manured br. loam	Pastures
5175.	<i>Avena pratensis</i> , E. B.	Oat oat grass, Brit.	E. B. 1304	Peren.	24	July 6.	—	Rich sandy loam	Pastures
5176.	<i>Bromus multiflorus</i> , E. B.	Many fl. g. brome gr. Brit.	E. B. 1884	Annual	24	July 6.	—	Sandy soil	Poor past., hedges
5179.	<i>Aira flexuosa</i> , E. B.	Wall fescue grass, Brit.	E. B. 1412	Peren.	9	July 6.	—	Light sandy soil	Walls
5180.	<i>Hordeum bulbosum</i> , Host. K. A.	Waved mountain hair gr. Brit.	E. B. 1519	Peren.	9	July 6.	—	Heath soil	Dry soils & heaths
5180.	<i>Festuca calamaria</i> , E. B.	Bulbous brome gr. Italy	—	Peren.	24	July 10.	—	Man. clayey loam	Loamy pastures
5181.	<i>Bromus litoreus</i> , Host. G. A.	Reed-like fescue gr. Brit.	E. B. 1005	Peren.	40	July 10.	—	Clayey loam	Hedges
5181.	<i>Festuca elatior</i> , E. B.	Seaside brome grass, Ger.	—	Peren.	20	July 12.	—	Clayey loam	Sea shores
5117.	<i>Festuca fluitans</i> , E. B.	Tall fescue grass, Brit.	E. B. 1593	Peren.	56	July 12.	—	Black rich loam	Meadows
5102.	<i>Holcus lanatus</i> , W.	Floating fescue grass, Brit.	E. B. 1520	Peren.	18	July 14.	—	Str. tenacious clay	Ponds
5183.	<i>Festuca dumeretorum</i> , W. K.	Meadow soft grass, Brit.	E. B. 1109	Peren.	24	July 14.	—	Strong clayey loam	Moist meadows
5184.	<i>Poa fertilis</i> , Host. G. A.	Pubescent fescue gr. Brit.	H. D. 709	Peren.	12	July 14.	—	Black sandy loam	Woods
5190.	<i>Phleum nodosum</i> , With.	Many fl. g. brome gr. Brit.	E. B. 884	Annual	24	July 14.	—	Clayey loam	Meadows
5116.	<i>Phleum pratense</i> , With.	Striped-lea. reed gr. Brit.	E. B. 402	Peren.	40	July 16.	—	Black sandy loam	Moist loams
5185.	<i>Hordeum pratense</i> , E. B.	Bulbous-stalked cat's tail grass, Brit.	—	Peren.	18	July 16.	—	Clayey loam	Dry pastures
5185.	<i>Hordeum pratense</i> , E. B.	Meadow cat's tail gr. Brit.	E. B. 409	Peren.	24	July 16.	—	Clayey loam	Mead. & pastures
5118.	<i>Poa compressa</i> , E. B.	Meadow barley grass, Brit.	E. B. 365	Peren.	24	July 20.	—	Man. brown loam	Meadows
5142.	<i>Poa aquatica</i> , E. B.	Flat-stalked mea. gr. Brit.	E. B. 1315	Annual	12	July 20.	—	Man. gravelly soil	Walls
5142.	<i>Aira aquatica</i> , E. B.	Reed meadow grass, Brit.	E. B. 1537	Peren.	72	July 20.	—	Str. tenacious clay	Ditches
5146.	<i>Avena fasciculata</i> , E. B.	Water hair grass, Brit.	E. B. 1557	Peren.	9	—	—	Water	Clayey pastures
5187.	<i>Avena fasciculata</i> , E. B.	Turfy hair grass, Brit.	E. B. 1453	Peren.	9	July 24.	—	Str. tenacious clay	Pastures
5187.	<i>Bromus sterilis</i> , E. B.	Yellow oat grass, Brit.	E. B. 952	Peren.	18	July 24.	—	Clayey loam	Pastures
5189.	<i>Holcus mollis</i> , E. B.	Creeping panic grass, Brit.	E. B. 1030	Annual	24	July 24.	—	Sandy soil	Clayey pastures
5191.	<i>Poa fertilis</i> , var. B Host. G. A.	Creeping soft grass, Brit.	—	Peren.	50	July 24.	—	Sandy soil	Sandy pastures
5191.	<i>Agrostis vulgaris</i> , E. B.	Fertile meadow gr. Ger.	—	Peren.	24	—	—	Brown sandy loam	Meadows
5191.	<i>Agrostis palustris</i> , E. B.	Fine bent grass, Brit.	E. B. 1671	Peren.	18	July 24.	—	Sandy soil	Mead. & pastures
5191.	<i>Panicum dactylon</i> , E. B.	Marsh bent grass, Brit.	E. B. 1189	Peren.	20	July 28.	—	Bog earth	Marshy places
5119.	<i>Agrostis stolonifera</i> , E. B.	Creeping panic grass, Brit.	E. B. 850	Peren.	24	July 28.	—	Man. sandy loam	Arable lands
5120.	<i>Agrostis stolonifera</i> , E. B.	Flower of Dr. Richardson, Brit.	E. B. 1532	Peren.	24	July 28.	—	Bog soil	Moist places
5120.	<i>Agrostis stolonifera</i> , E. B.	Narrow-leaved, creeping bent grass, Brit.	—	Peren.	24	July 28.	—	Bog soil	Moist places
5191.	<i>Festuca pennata</i>	Spiked fescue, Brit.	E. B. 730	Peren.	24	July 28.	—	Man. light san. soil	Meadows
5191.	<i>Agrostis canina</i> , E. B.	Upright bent grass, Brit.	E. B. 1856	Peren.	9	July 28.	—	Brown sandy loam	Clayey pastures
5191.	<i>Agrostis stricta</i> , Curtis	Snowy bent grass, Brit.	—	Peren.	9	July 28.	—	Bog soil	Clayey pastures
5191.	<i>Agrostis nivea</i>	Tufted-lea. bent gr. Brit.	—	Peren.	9	Aug. 10.	—	Sandy soil	Clayey pastures
5191.	<i>Agrostis fasciculata</i> , var. <i>canina</i> , Curtis	Green panic grass, Brit.	E. B. 875	Annual	36	Aug. 2.	—	Light sandy soil	Sandy
5191.	<i>Panicum viride</i> , Curtis	Lober bent grass, Brit.	—	Peren.	20	Aug. 6.	—	Sandy soil	Sandy pastures
5120.	<i>Agrostis lobata</i> , Curtis	Black or creeping rooted bent, bl. couch, Brit.	—	Peren.	26	Aug. 8.	—	Clayey loam	Arable lands
5120.	<i>Agrostis repens</i> , With.	Creeping rooted wheat gr. or couch gr. Brit.	E. B. 848	Peren.	30	Aug. 10.	—	Light clayey loam	Arable lands
5120.	<i>Alopecurus agrestis</i>	Hairy stalked br. gr. Brit.	E. B. 1172	Annual	8	Aug. 10.	—	Light sandy loam	Road sides
5120.	<i>Bromus asper</i> , E. B.	Mexican bent gr. S. Amer.	E. B. 1210	Annual	48	Aug. 10.	—	Light sandy soil	Moist san. places
5120.	<i>A. mexicana</i> , Host. K.	Long awned fca. gr. Brit.	E. B. 1356	Peren.	24	Aug. 15.	—	Black sandy soil	Rich pastures
5120.	<i>Stipa pennata</i> , E. B.	Purple mead. grass, Brit.	E. B. 909	Peren.	20	Aug. 15.	—	Heath soil	Peat bogs
5120.	<i>Melica carulea</i> , Curtis	Com. Canary grass, Brit.	E. B. 750	Annual	26	Aug. 20.	—	Light sandy soil	Sandy pastures
5120.	<i>Pteralis canariensis</i> , E. B.	Amer. cock's foot gr. N.A.	—	Annual	26	Aug. 30.	—	Clayey loam	Cultivated fields
5120.	<i>Dactylis cynosuroides</i> , Lm.	—	—	Annual	21	Aug. 30.	—	Clayey loam	Loamy pastures

Woburn, arranged in the Order of their Flowering.

No. in Order of Flowering.	Kind of Roots.	Produce, at the Time of flowering, per Acre in lbs.				Produce, when the Seed is ripe, per Acre in lbs.				Loss or Gain by Cutting, when in Flower, in Nutritive Matter, in lbs.		Loss or Gain by Cutting, when in Seed, in Nutritive Matter, in lbs.		Produce of the Latter-math, per Acre, in lbs.		General Character.
		Grass.	Hay.	Loss in Drying.	Nutritive Matter.	Grass.	Hay.	Loss in Drying.	Nutritive Matter.	Loss.	Gain.	Loss.	Gain.	Grass.	Nutritive Matter.	
5137.	Fibrous	7827	2103	5723	122	6125	1837	4287	511	188	-	-	188	6806	3828	An early pasture grass.
5138.	—	9528	2441	7087	610	27225	9528	17696	2253	1600	-	-	1600	17015	1129	The most nutritive of early flow. gr.
5139.	Fibrous	5445	1452	3993	85	6806	-	-	398	-	-	-	-	-	-	Not deserving culture
5140.	{ Fibrous.	5445	1452	3993	85	-	-	-	-	-	-	-	-	-	-	Not worth culture.
5141.	{ Fibrous.	20418	6125	14293	478	12931	5819	7111	461	-	-	-	-	8167	256	A good grass for lawns.
5142.	Creep.	8507	2532	-	132	-	-	-	-	-	-	-	-	-	-	One of the best meadow grasses.
5143.	Creeping	10209	2871	7337	279	8507	3403	5104	199	-	79	79	-	4083	111	Good early hay grass.
5144.	Creeping	7486	2246	5240	233	-	-	-	-	-	-	-	-	-	-	-
5145.	—	15654	5870	9783	366	6806	1361	5445	212	-	154	154	-	6806	212	A good pasture grass on a rich soil.
5146.	Fibrous	15672	4083	9528	478	-	-	-	-	-	-	-	-	-	-	-
5147.	Fibrous	7486	2246	5240	233	7827	3522	4304	336	102	-	-	102	4764	223	A most valuable gr. in moist rich soils.
5148.	Fibrous	9528	4811	5717	446	9528	3811	5717	223	-	-	-	-	-	-	A good hay grass.
5149.	Fibrous	14293	5717	8576	446	9528	3811	5717	186	260	260	260	-	6125	47	A tolerably good pasture grass.
5150.	Fibrous	10209	5357	6651	239	10890	4900	5989	340	101	-	-	101	3403	79	Good lawn grass.
5151.	Fibrous	9528	3096	6431	409	9528	3333	6183	483	74	-	-	74	8167	256	Good lawn grass.
5152.	Fibrous	27905	11859	16045	1089	26544	13272	13272	1451	362	362	-	362	11910	281	A most productive grass, but coarse.
5153.	Fibrous	7486	3930	3556	350	-	-	-	-	-	-	-	-	-	-	Of little value.
5154.	Fibrous	6806	2892	2913	239	-	-	-	-	-	-	-	-	-	-	A good lawn grass.
5155.	Fibrous	20418	8677	11740	957	-	-	-	-	-	-	-	-	-	-	-
5156.	Fibrous	18376	7810	10566	1450	9528	3811	5717	701	-	649	649	-	-	-	Excellent hay grass.
5157.	Creep. & Knot.	-	-	-	-	16335	5717	10617	253	-	-	-	-	13612	265	A vile weed in arable lands.
5158.	Creep. & Knot.	12251	4287	3617	662	-	-	-	-	-	-	-	-	-	-	A vile weed in arable lands.
5159.	Fibrous	18376	8269	10106	1004	19073	8575	10481	446	-	558	558	-	10209	199	A good grass for hay or pasture.
5160.	Fibrous	12931	5819	7112	553	-	-	-	-	-	-	-	-	-	-	Not worth culture.
5161.	Fibrous	12251	4747	7504	354	-	-	-	-	-	-	-	-	-	-	Of little value.
5162.	Creeping	13612	6465	7146	957	19037	7623	11434	446	337	510	510	-	3403	53	Excellent early hay grass.
5163.	Fibrous	7827	3322	4494	303	14973	4492	10481	645	-	-	-	-	12251	191	A well known & generally esteemed gr.
5164.	—	12251	4900	7350	861	-	-	-	-	-	-	-	-	-	-	-
5165.	—	16335	7146	9188	763	10890	4492	6397	553	-	212	212	-	5403	66	One of the most valu. gr. for hay & past.
5166.	Fibrous	10890	4900	5989	340	-	-	-	-	-	-	-	-	-	-	A good lawn grass.
5167.	Fibrous	6125	1837	4287	406	12251	4900	7350	478	71	-	71	-	-	-	A good lawn grass.
5168.	Fibrous	6806	1871	4934	239	9528	2858	6670	148	-	-	-	-	-	-	-
5169.	Fibrous	22460	12333	10107	17154	-	-	-	-	-	-	-	-	-	-	Unfit for culture.
5170.	Fibrous	9528	2838	6670	222	-	-	-	-	-	-	-	-	-	-	A very inferior grass.
5171.	Fibrous	8167	5164	5002	191	-	-	-	-	-	-	-	-	-	-	Fit for lawns.
5172.	—	23821	9826	13994	1302	-	-	-	-	-	-	-	-	-	-	Of little use.
5173.	—	54450	19057	35392	3828	51046	12123	38493	2399	-	1433	1435	-	-	-	Early and prolific.
5174.	—	41518	21278	20540	973	38115	15246	22869	2084	-	1111	1111	-	-	-	Early, prolific, and coarse.
5175.	—	51046	17866	33180	3988	51046	17866	33180	2399	-	1592	1595	-	15654	978	An excellent meadow grass.
5176.	Creeping	13612	6083	9528	373	-	-	-	-	-	-	-	-	-	-	An aqua. or amphib. gr. of good qual.
5177.	—	10890	5445	5445	170	19037	3811	15446	818	-	372	372	-	-	-	Early and productive.
5178.	—	14973	7861	7111	1052	-	-	-	-	-	-	-	-	-	-	An early grass.
5179.	Creeping	27225	12251	-	1701	-	-	-	-	-	-	-	-	-	-	Productive.
5180.	Creeping	12251	5819	6431	478	-	-	-	-	-	-	-	-	-	-	-
5181.	Creeping	40837	17353	25481	1503	10837	19397	21439	3668	-	2072	2075	-	9528	297	An excellent hay grass.
5182.	—	8167	3267	4900	478	-	-	-	-	-	-	-	-	-	-	Early and nutritive.
5183.	—	3403	1446	1956	265	-	-	-	-	-	-	-	-	-	-	-
5184.	Creeping	126596	75957	50638	4940	-	-	-	-	-	-	-	-	-	-	Most prolific, but coarse.
5185.	—	10890	3267	7623	383	-	-	-	-	-	-	-	-	-	-	-
5186.	—	10209	3318	6891	318	-	-	-	-	-	-	-	-	-	-	-
5187.	—	8167	2838	3308	478	12251	4900	7350	430	-	47	47	-	4083	79	An excellent lawn grass.
5188.	Fibrous	29247	16845	13102	2339	-	-	-	-	-	-	-	-	-	-	Of little value.
5189.	Creeping	54031	13612	20418	2392	21099	8439	12659	1155	-	1238	1238	-	-	-	A valuable grass.
5190.	—	15654	6653	9000	733	14973	8235	6738	1169	436	-	-	436	4764	111	A valuable grass.
5191.	—	9528	4764	4764	251	-	-	-	-	-	-	-	-	-	-	An early grass.
5192.	Creeping	10209	4594	5615	458	13612	5445	8167	584	146	-	-	146	-	-	Useful.
5193.	—	31308	14088	12719	9783	-	-	-	-	-	-	-	-	-	-	-
5194.	Creeping	17696	7742	9732	967	19037	8575	10481	1042	74	-	-	-	-	-	Useful on bogs.
5195.	Creeping	16335	7350	8984	765	-	-	-	-	-	-	-	-	-	-	-
5196.	—	20418	8167	12251	398	-	-	-	-	-	-	-	-	-	-	-
5197.	—	6125	2688	3437	239	-	-	-	-	-	-	-	-	-	-	-
5198.	—	7486	2715	4772	175	-	-	-	-	-	-	-	-	-	-	-
5199.	—	2722	680	2041	85	4764	1510	3454	148	-	-	-	-	-	-	Of no value.
5200.	—	5445	2178	2367	127	-	-	-	-	-	-	-	-	-	-	-
5201.	—	6806	3403	3043	319	-	-	-	-	-	-	-	-	-	-	-
5202.	Creeping	6125	2679	5445	287	-	-	-	-	-	-	-	-	-	-	A vile weed on poor arable lands.
5203.	Creeping	12251	4900	7350	383	-	-	-	-	-	-	-	-	-	-	A vile weed in arable lands.
5204.	—	8167	3164	5003	222	-	-	-	-	-	-	-	-	-	-	-
5205.	Fibrous	13612	4083	9528	423	-	-	-	-	-	-	-	-	-	-	Unfit for culture.
5206.	—	19037	6670	12387	595	-	-	-	-	-	-	-	-	-	-	Deserves trial.
5207.	Fibrous	9528	3454	6074	409	-	-	-	-	-	-	-	-	-	-	Not worth culture.
5208.	—	7486	2807	4679	172	-	-	-	-	-	-	-	-	-	-	A good lawn grass.
5209.	Fibrous	54450	17697	36732	1876	-	-	-	-	-	-	-	-	-	-	Grown for its seeds.
5210.	—	69423	41654	27769	1898	-	-	-	-	-	-	-	-	-	-	-

5157. *Anthoxanthum odoratum*, E. B. — The proportional value which the grass at the time of flowering bears to that at the time the seed is ripe, is as 4 to 13. The proportional value which the grass of the latter-math bears to that at the time the seed is ripe, is nearly as 9 to 13.

5158. *Holcus odoratus*, Hora. G. A. — The proportional value which the grass at the time of flowering bears to that at the time the seed is ripe, is as 17 to 21. The grass of the latter-math crop, and of the crop at the time of flowering, taking the whole quantity, and their relative proportions of nutritive matter, are in value nearly as 6 to 10: the value of the grass at the time the seed is ripe, exceeds that of the latter-math, in proportion as 21 to 17. Though this is one of the earliest of the flowering grasses, it is tender, and the produce in the spring is inconsiderable. If, however, the quantity of nutritive matter which it affords, be compared with that of any of those species which flower nearly at the same time, it will be found greatly superior. It sends forth but a small number of flower-stalks, which are of a slender structure compared to the size of the leaves. This will account in a great measure for the equal quantities of nutritive matter afforded by the grass at the time of flowering, and the latter-math.

5159. *Cynosurus carydatus*, E. B. — The produce of this grass is greater than its appearance would denote; the leaves seldom attain to more than four or five inches in length, and the flower-stalks seldom arise to more. Its growth is not rapid after being cropped, nor does it seem to withstand the effects of frost, which if it happen to be severe and early in the spring, checks it so much as to prevent it from flowering for that season; otherwise the quantity of nutritive matter which the grass affords (for the straws are very inconsiderable), would rank it as a valuable grass for permanent pasture.

5160. *Avena pubescens*, E. B. — The proportional value which the grass at the time of flowering bears to that at the time the seed is ripe, is as 6 to 8. The proportional value which the grass at the time of flowering bears to that of the latter-math, is as 6 to 8. The grass of the seed-crop, and that of the latter-math, are of equal value. The downy hairs which cover the surface of the leaves of this grass, when growing on poor light soils, almost entirely disappear when it is cultivated on a richer soil.

5161. *Poa carulea*, var. *pratensis*, E. B. — If the produce of this variety be compared with that of *poa pratensis*, it will be found less; nor does it seem to possess any superior excellence. The superior nutritive power does not make up for the deficiency of produce by 80 lbs. of nutritive matter per acre.

5162. *Festuca horridiformis*, H. Cant. — This is rather an early grass, though later than any of the preceding species: its foliage is very fine, resembling the *F. duriuscula*, to which it seems nearly allied, differing only in the length of the awns, and the glaucous color of the whole plant. The considerable produce it affords, and the nutritive powers it appears to possess, joined to its early growth, are qualities which strongly recommend it to further trial.

5163. *Festuca glauca*, Curtis. — The proportional value by which the grass at the time of flowering exceeds that at the time the seed is ripe, is as 6 to 12. The proportional difference in the value of the flowering and seed crops of this grass is directly the reverse of that of the preceding species, and affords another strong proof of the value of the straws in grass which is intended for hay. The straws at the time of flowering are of a very succulent nature; but from that period till the seed be perfected, they gradually become dry and wiry. Nor does the root-leaves sensibly increase in number or in size, but a total suspension of increase appears in every part of the plant, the roots and seed vessels excepted. The straws of the *poa trivialis* are, on the contrary, at the time of flowering, weak and tender; but as they advance towards the period of ripening the seed, they become firm and succulent; after that period, however, they rapidly dry up, and appear little better than a mere dead substance.

5164. *Festuca glabra*, Wither. B. — The proportional value which the grass at the time the seed is ripe bears to that of the crop at the time of flowering is as 5 to 8. The proportional value which the grass of the latter-math bears to that of the crop at the time of flowering, is as 2 to 8, and to that of the crop, at the time the seed is ripe, is as 2 to 5. The general appearance of this grass is very similar to that of the *festuca duriuscula*: it is, however, specifically different, and inferior in many respects, which will be manifest on comparing their several produce with each other; but if it be compared with some others, now under general cultivation, the result is much in its favor, the soil which it affects being duly attended to.

5165. *Festuca rubra*, Wither. B. — The proportional value which the grass at the time of flowering bears to that at the time the seed is ripe, is as 6 to 8. This species is smaller in every respect than the preceding. The leaves are seldom more than from three to four inches in length; it affects a soil similar to that favorable to the growth of the *festuca ovina*, for which it would be a profitable substitute, as will clearly appear on a comparison of their produce with each other. The proportional value which the grass of the latter-math bears to that at the time the seed is ripe is as 6 to 8, and is of equal value with the grass at the time of flowering.

5166. *Festuca ovina*, E. B. — The dry weight of this species was not ascertained, because the smallness of the produce renders it entirely unfit for hay.

5167. *Festuca cambrica*, Hud. — This species is nearly allied to the *festuca ovina*, from which it differs little, except that it is larger in every respect. The produce, and the nutritive matter which it affords, will be found superior to those given by the *F. ovina*, if they are brought into comparison.

5168. *Bromus diandrus*, Curt. Lond. — This species, like the *festuca cambrica*, is strictly annual; the above is therefore the produce for one year, which, if compared with that of the least productive of the perennial grasses, will be found inferior, and it must consequently be regarded as unworthy of culture.

5169. *Poa angustifolia*, With. 2. — In the early growth of the leaves of this species of *Poa*, there is a striking proof that early flowering in grasses is not always connected with the most abundant early produce of leaves. In this respect, all the species which have already come under examination are greatly inferior to that now spoken of. The culms are most valuable for the manufacture of the finest straw plait.

5170. *Avena elatior*, Curt. — This grass sends forth flower-straws during the whole season; and the latter-math contains nearly an equal number with the flowering crop. It is subject to the rust, but the disease does not make its appearance till after the period of flowering; it affects the whole plant, and at the time the seed is ripe the leaves and straws are withered and dry. This accounts for the superior value of the latter-math over the seed crop, and points out the propriety of taking the crop when the grass is in flower.

5171. *Poa elatior*, Curt. — The botanical characters of this grass are almost the same as those of the *avena elatior*, differing in the want of the awns only. It has the essential character of the *holcus*, (florets, male and hermaphrodite; calyx huks two-valved, with two florets); and since the *avena elatior* is now referred to that genus, this may with certainty be considered a variety of it.

5172. *Festuca duriuscula*, E. B. — The proportional value which the grass at the time the seed is ripe, bears to that at the time of flowering, is as 6 to 14 nearly. The proportional value which the grass of the latter-math bears to that at the time of flowering, is as 5 to 14, and to that at the time the seed is ripe 5 to 6. The above particulars will confirm the favorable opinion which was given of this grass when speaking of the *F. horridiformis*, and *F. glabra*. (5162. and 5164.) Its produce in the spring is not very great, but of the finest quality, and at the time of flowering is considerable. If it be compared with those affecting similar soils, such as *poa pratensis*, *festuca ovina*, &c, either considered as a grass for hay, or permanent pasture, it will be found of greater value.

5173. *Milium efusum*. — This species in its natural state seems confined to woods as its place of growth; but the trial that is here mentioned, confirms the opinion that it will grow and thrive in open exposed situations. It is remarkable for the lightness of the produce in proportion to its bulk. It produces foliage early in the spring in considerable abundance; but its nutritive powers appear comparatively little.

5174. *Poa maritima*, E. B. — The proportional value which the grass of the lattermath bears to that at the time of flowering, is as 4 to 18.

5175. *Avena pratensis*, E. B. — The proportional value which the crop, at the time the seed is ripe, bears to that at the time of flowering, is as 4 to 9.

5176. *Bromus multiflorus*, E. B. — This species is annual, and no valuable properties have as yet been discovered in the seed. It is only noticed on account of its being frequently found in poor grass lands, and sometimes in meadows. It appears from the above particulars to possess nutritive powers equal to some of the best perennial kinds, if taken when in flower; but if left till the seed be ripe (which, from its early growth, is frequently the case), the crop is comparatively of no value, the leaves and straws being then completely dry.

5177. *Festuca lolacea*, Curt. Lond. — The proportional value which the grass at the time of flowering bears to that at the time the seed is ripe, is as 12 to 13; and the value of the lattermath stands in proportion to that of the crop at the time of flowering, as 5 to 12, and to that of the crop taken at the time the seed is ripe, as 5 to 13. This species of *Festuca* greatly resembles the rye-grass, in habit and place of growth; it has excellencies which make it greatly superior to that grass, for the purposes of either hay or permanent pasture. This species seems to improve in produce in proportion to its age, which is directly the reverse of the *lolium* perenne.

5178. *Poa cristata*, Host. G. A. — The produce of this species, and the nutritive matter that it affords, are equal to those of the *Festuca ovina* at the time the seed is ripe: they equally delight in dry soils. The greater bulk of grass in proportion to the weight, with the comparative coarseness of the foliage, render the *Poa cristata* inferior to the *Festuca ovina*.

5179. *Festuca myuros*, E. B. — This species is strictly annual; it is likewise subject to the rust; and, the produce being but little, it ranks as a very inferior grass.

5180. *Festuca calamaria*, E. B. — The proportional value which the grass at the time the seed is ripe, bears to that at the time of flowering, is as 12 to 18. This grass, as has already been remarked, produces a fine early foliage in the spring. The produce is very great, and its nutritive powers are considerable. It appears, from the above particulars, to be best adapted for hay. A very singular disease attacks, and sometimes nearly destroys the seed of this grass: the cause of this disease seems to be unknown; it is denominated *clavus* by some; it appears by the seed swelling to three times its usual size in length and thickness, and the want of the carcle. Dr. Willdenow describes two distinct species of it: first the simple *clavus*, which is mealy and of a dark color, without any smell or taste; secondly, the malignant *clavus*, which is violet blue, or blackish, and internally too has a blueish color, a fetid smell, and a sharp pungent taste. Bread, made from grain affected with this last species, is of a blueish color; and when eaten produces cramps and giddiness.

5181. *Bromus littoreus*, Host. G. A. — The proportional value which the grass at the time of flowering bears to that at the time the seed is ripe, is as 6 to 14. This species greatly resembles the preceding in habit and manner of growth; but is inferior to it in value, which is evident from the deficiency of its produce, and of the nutritive matter afforded by it. The whole plant is likewise coarser, and of greater bulk in proportion to its weight. The seed is affected with the same disease which destroys that of the former species.

5182. *Festuca sulcata*, Curt. Lond. — The above produce was taken from grass that had occupied the ground for four years, during which time it had increased every year; it appears, therefore, contrary to what some have supposed, to be capable of being cultivated in perennial pastures.

5183. *Poa fertilis*, Host. G. A. — If the nutritive powers and produce of this species be compared with any other of the same family, or such as resemble it in habit and the soil which it affects, a superiority will be found, which ranks this as one of the most valuable grasses; next to the *Poa angustifolia*, it produces the greatest abundance of early foliage, of the best quality, which fully compensates for the comparative lateness of flowering.

5184. *Arenaria colorata*, Hort. Kew. — The strong nutritive powers which this grass possesses, recommend it to the notice of occupiers of strong clayey lands which cannot be drained. Its produce is great, and the foliage will not be denominated coarse, if compared with those which afford a produce equal in quantity.

5185. *Hordeum pratense*, E. B. — The specific characters of this species are much the same as those of the *Poa fertilis*, differing in the compressed figure of the straws and creeping root only. If the produce was of magnitude, it would be one of the most valuable grasses; for it produces foliage early in the spring, and possesses strong nutritive powers.

5186. *Avena flavescens*, Curt. Lond. — The proportional value which the grass at the time the seed is ripe, bears to that at the time of flowering, is as 9 to 15. The proportional value which the grass of the lattermath bears to that at the time of flowering, is as 5 to 15; and to that at the time the seed is ripe, as 5 to 9.

5187. *Bromus sterilis*, E. B. — Sixty-four dr. of the flowers afford of nutritive matter 2.2 dr. The nutritive powers of the straws and leaves are, therefore, more than twice as great as those of the flowers. This species, being strictly annual, is of comparatively little value. The above particulars show that it has very considerable nutritive powers, more than its name would imply, if taken at the time of flowering; but if left till the seed be ripe, it is, like all other annuals, comparatively of no value.

† 5188. *Holcus mollis*. — Sixty-four dr. of the roots afford of nutritive matter 5.2 dr. The proportional value which the grass at the time the seed is ripe, bears to that at the time of flowering, is as 14 to 18. The above details prove this grass to have merits, which, if compared with those of other species, rank it with some of the best grasses. The small loss of weight which it sustains in drying might be expected from the nature of the substance of the grass; and the loss of weight at each period is equal. The grass affords the greatest quantity of nutritive matter when in flower, which makes it rank as one of these best adapted for hay.

5189. *Poa fertilis*, var. β . Host. G. A. — The proportional value which the grass at the time of flowering bears to that at the time the seed is ripe, is as 12 to 20. The proportional value which the grass of the lattermath bears to that at the time of flowering, is as 6 to 12; and to that at the time the seed is ripe, as 6 to 20.

5190. *Phleum nodosum*, Wither. — This grass is inferior in many respects to the *phleum pratense*. It is sparingly found in meadows. From the number of bulbs which grow out of the straws a greater portion of nutritive matter might have been expected. This seems to prove that these bulbs do not form so valuable a part of the plant as the joints, which are so conspicuous in the *phleum pratense*, the nutritive powers of which exceed those of the *P. nodosum*, as 8 to 28.

5191. *Agrostis vulgaris*, Wither. — This is one of the most common of the bents, and likewise the earliest; in these respects it is superior to all others of the same family, but inferior to several of them in produce, and the quantity of nutritive matter it affords. As the species of this family are generally rejected by the cultivator on account of the lateness of their flowering; and this circumstance, as has already been observed, does not always imply a proportional lateness of foliage, their comparative merits in this respect may be better seen, by bringing them into one view, as to the value of their early foliage.

The apparent Difference of Time.		Their nutritive Powers.	The apparent Difference of Time.		Their nutritive Powers.
<i>Agrostis vulgaris</i>	— Middle of April .	1.23	<i>Agrostis ovina</i>	— Three weeks later .	— 3
<i>palustris</i>	— One week later .	2.3	<i>littoralis</i>	— Ditto ditto .	— 3
<i>scaberrima</i>	— Two ditto .	3.2	<i>repens</i>	— Ditto ditto .	— 3
<i>canadensis</i>	— Ditto ditto .	— 1.3	<i>mexicana</i>	— Ditto ditto .	— 2
<i>stricta</i>	— Ditto ditto .	— 1.2	<i>fascicularis</i>	— Ditto ditto .	— 2

5192. *Panicum sanguinale*, E. B. — This species is strictly annual; and from the results of this trial, its nutritive powers appear to be very inconsiderable.

5193. *The grasses which afford the best culms for straw plait* are, according to Sinclair, as follow :

For heat or poor soil. *Festuca ovina*, *duriuscula* and *hor-diformis*, *Nardus stricta*.

Dry soils. *Cynurus cristatus*, *poa angustifolia*, *hordeum pratense*, *anthoxanthum odoratum*, *agrostis lobata*, *spicaveni*, *flavescens* and *vulgaris mutica*, *avena pubescens*, *festuca heterophylla*.

Moist soils. *Agrostis canina*, *fascicularis*, *canina mutica*, *stolonifera angustifolia*, *stolonifera cristata*, *alba*, *stricta*, *repens*, *poa nemoralis*, *angustifolia*.

Cereal grasses. Wheat, spelt-wheat, rye and oats, have been sown on poor soils, and cut green and bleached, but are found inferior to the above grasses for the finest plait.

5194. *The period for cutting the culms* is when they are in blossom. They are bleached by pouring boiling water over them, in which they remain ten minutes, and are afterwards spread on a grass plat for seven or eight days. Sinclair found letting the culms remain in hot water from one to two hours required only two or three days bleaching. When bleached they are taken up, washed clean, and put in a moist state in a close vessel, where they are subjected to the fumes of burning sulphur for two hours. Green culms, immersed for ten minutes in a strong solution of acetic acid, and then subjected to the sulphurous acid gas, are bleached perfectly white in half an hour. Green culms, immersed for fifteen minutes in muriatic acid, diluted with twenty times its measure of water, and then spread on the grass, became in four days as perfectly bleached as those culms which were scalded and bleached eight days on the grass. The texture of the straw was not in the least injured by these processes. The application of the sulphurous acid gas to the moistened culms, even after scalding and bleaching on the grass, had, in every instance, the effect of greatly improving the color, and that without being productive of the smallest injury to the texture of the straw. (*Hort. Gram. Web. 2nd edit. 427.*)

5195. *To imitate the Leghorn plait in the most perfect manner*, the straws should be plaited the reverse way of the common English split-straw plait. In the English plait, the straws are flattened by a small hand-mill made for the purpose, but the Leghorn plait has the straws worked without flattening, and pressure is applied after the plait is made. These two points are essential to be observed by those who wish to rival the finest Leghorn manufacture. By reversing the common mode of plaiting, the fingers have a much greater power in knitting firmly and intimately the straws, and the round or unflattened state of the straws allows of their being more closely knitted; a circumstance that gives an appearance similar to the real Leghorn plait. (*Ibid.*)

CHAP. VII.

Of the Management of Lands permanently under Grass.

5196. In every country by far the greater proportion of perennial grass lands is the work of nature : and it is not till an advanced period in the progress of agriculture that much attention is paid to their management. But as the extension of tillage, planting, and the formation of parks and gardens, limits the range of the domestic animals, their food becomes more valuable; and it then becomes an object to increase it by the culture of roots and artificial herbage on some lands, and by the improved management of the spontaneous productions of others. In a highly cultivated country like Britain, therefore, those lands retained in grass either are, or ought to be, such as are more valuable to the owners in that state than they would be in any other. Such lands naturally divide themselves into two classes : those which are fit either for mowing or pasture; and those which are fit for pasture only.

SECT. I. *Perennial Grass Lands fit for mowing, or Meadow Lands.*

5197. *Under the term meadow*, we include all such land as is kept under grass chiefly for the sake of a hay crop, though occasionally, and at particular seasons of the year, it may be depastured by the domestic animals; and we usually include under this term the notion of a greater degree of moisture in the soil, than would be thought desirable either for permanent pasture or lands in tillage. Where hay is in great demand, as near large towns, and especially if a good system of cropping be but little understood, a great deal of arable land may be seen appropriated to hay-crops; but the most valuable meadows are such as are either naturally rather moist, or that are rendered so by means of irrigation. There are three descriptions of these meadows : on the banks of streams and rivers; on the uplands, or more elevated grounds; and bog-meadows; and each of these kinds may be stocked with grasses either naturally or by art, and may be irrigated by one or other of the different watering processes already described. (4053.)

5198. *River-meadows*, or those which are situated in the bottoms of valleys, are in general by far the most valuable. They are the most productive of grass and hay, yielding sustenance for cattle through the summer and the winter, and producing an everlasting source of manure for the improvement of the adjoining lands. The soil is deep and commonly alluvial, having been deposited by water, or washed down from the adjoining eminences; the surface is even from the same cause; and what is of considerable importance, has a gradual declivity or surface-drainage to the river or stream, which almost invariably flows in the lowest part of every valley, and which is essential to this description of meadow. The principal defects to which such lands are liable are, the oozing out of springs towards their junction with the rising lands, and the inundations of the river or stream. The former evil is to be remedied by under-draining, and the latter by

embanking. Such meadows are generally stocked with the best grasses; and their culture consists of little more than forming and keeping open a sufficient number of surface-gutters or furrows to carry off the rain-water; rooting out such tufts of rushes or bad grasses and herbage, as may occasionally appear; destroying moles, and spreading the earth they throw up; removing heavy stock whenever their feet poach the surface; shutting up, bush-harrowing, and rolling at the commencement of the growing season; and finally so adjusting the mowing and pasturing as to keep the land in good heart without laying on manure.

5199. *The most suitable meadows for irrigation* are of this description; the necessary drains and other works are executed with greater care, and with less expense, and the management, as we have seen (4057.), is also comparatively easier than in watering sloping surfaces.

5200. *Upland meadows*, or mowing lands, are next in value to those of valleys. The soil is either naturally good, and well adapted for grass, or, if inferior by nature, it is so situated as to admit of enriching it by ample supplies of manure. Of this last description are the upland meadows, or hay lands of Middlesex; which, though on the most tenacious, and often stony clays, are yet, by the abundance of manure obtained from the metropolis, rendered as productive as the best upland soils employed as hay lands. The roots of perennial grasses, whether fibrous or creeping, never strike deep into the soil; and thus deriving their nourishment chiefly from the surface top dressings of well-rotted manure repeated on the same field for centuries, forms at last a thin black stratum among the roots of the grass, which produces the most luxurious crops.

5201. *The culture of upland meadows* requires more attention and expense than those of valleys; being more difficult to drain, and requiring regular supplies of manure. The irregular surface of uplands is apt either to contain springs or to stagnate the surface water; the first produces marsh plants and coarse herbage, and the latter destroys or weakens whatever is growing on the surface, and encourages the growth of moss. Both evils are to be remedied by the obvious resources of drainage. Moss is a very common enemy to grass lands, and is only to be effectually destroyed by rich dressings of manure. Rolling, and top-dressings of lime and salt, have been recommended for destroying it; but there is no mode by which it can be subdued and kept under, but by adding strength to the grass plants, and thereby enabling them to suffocate their enemy. Moss is never found on rich lands unless they are completely shaded by trees. Besides mole-hills, upland meadows, when neglected, are frequently troubled with ants, which form heaps or hillocks of grass and earth, more injurious and more difficult to get quit of than those of moles. The mode of taking moles is a simple operation, and will be described in the proper place: that of destroying ants is more complicated and tedious, and being peculiar to grass lands, shall here be described.

5202. *Ant-hills, or habitations*, are injurious to meadow lands, by depriving the farmer of a crop in proportion to the surface they occupy, and by interfering with the operations of rolling and mowing. They consist of little eminences, composed of small particles of sand or earth, lightly and artfully laid together, which may often be computed at a tenth part, or more, of old grass lands. And in some places, where negligence has suffered them to multiply, almost half of it has been rendered useless; the hills standing as thick together as grass-cocks in a hay-field: and what is very surprising, this indolence is defended by some, who affirm, that the area or superficies of their land is thereby increased; whereas it is well known that very little or no grass ever grows thereon, and, therefore, if the surface be increased, the produce is proportionably decreased.

5203. *In order to remove ant-hills*, and destroy the insects, it has been a custom in some places, at the beginning of winter, and often when the weather was not very cold, to dig up the ant-hills three or four inches below the surface of the ground, and then to cut them in pieces, and scatter the fragments about: but this practice only disseminates the ants, instead of destroying them, as they hide themselves among the roots of the grass for a little time, and then collect themselves together again upon any little eminence, of which there are great numbers ready for their purpose, such as the circular ridges round the hollows where the hills stood before. It is, therefore, a much better method to cut the hills entirely off, rather lower than the surface of the land, and to let them lie whole at a little distance, with their bottom upwards: by this means the ants, which are known to be very tenacious of their abodes, continue in their habitations until the rains, by running into their holes of communication, and stagnating in the hollows formed by the removal of the hills, and the frosts which now readily penetrate, destroy them. If a little soil were thrown on the places, and washed in with the rains, it would probably contribute greatly to the intended effect. The hills, when rendered mellow by the frosts, may be broken and dispersed about the land. By this method of cutting the hills, one other advantage is gained; the land soon becomes even and fit for mowing, and the little eminences being removed, the insects are exposed to the wet, which is very disagreeable and destructive to them. It would, perhaps, be a better practice than that of suffering the hills to remain on the ground, to collect the parts of them which have been pared off into a heap, in some convenient place, and then form them into a compost, by mixing a portion of quick-lime with them. In wet weather these insects are apt to accumulate heaps of sandy particles among the grass, called by laborers sprout-hills, which quickly take off the edge of the scythe. These hills, which are very light and compressible, may be conveniently removed by frequent heavy rolling.

5204. *In the Norfolk mode of cutting and burning ant-hills*, the process is, to cut them up with a beak-shaped sharp spade or shovel, in irregular lumps of from ten to fifteen inches in diameter, and from two

to five or six inches thick. These are to be turned the grass-side downwards, until the mould-side is thoroughly dry, and then to be set the grass-side outwards, until they are dry enough to burn. The fire may be kindled with brushwood, and kept smothering, by laying the sods or lumps on gradually, as the fire breaks out, until ten or fifteen loads of ashes are raised in one heap, which the workmen formerly completed for a shilling or eighteen-pence each load of ashes. The places from which the hills have been removed may be sown with grass-seeds. Besides the destruction of the ants, this is a ready, though by no means an economical way of raising manure, and in some cases ought not to be neglected, on grounds where such a process is required. On some soils ashes are found in themselves an excellent manure; and, perhaps, generally, ashes raised in this way, would be found highly advantageous as bottomings for farm-yards and dunghills.

5205. *Where grass lands are sufficiently rolled with a heavy roller once or oftener every year, no ant-hills will ever be formed greater than the roller can compress, and consequently no injury will be sustained.* In this, as in most other cases of disease, proper regimen is the best cure. In domestic economy, various directions are given for destroying bugs, lice, and other vermin; but who ever had any to destroy, who attended properly to cleanliness?

5206. *The surface of some grass lands that have been long rolled are apt to get into that tenacious state denominated hide bound.* When this is the case, scarifying the turf with a plough, consisting only of coulters, or harrow-teeth, so that the whole surface may be cut or torn, is to be recommended. That tenacious state, rolling tends to increase; whereas, by scarifying, the surface is loosened, and the roots acquire new means of improved vegetation. This operation seems particularly useful, when it precedes the manuring. When hay land of a retentive quality is pastured by cattle or horses in wet seasons, it receives much injury from their feet, and becomes what is technically called poached. Every step they take, leaves an impression, which rain fills with water, and then the hole stands full like a cup. This wetness destroys the herbage, not only in the hole, but that also which surrounds it, while at the same time the roots of the grasses, as well as the ground, are chilled and injured. No good farmer, therefore, will permit any cattle to set a foot on such land in wet weather, and few during the winter months, on any consideration. Sheep are generally allowed to pasture on young grasses in dry weather, from the end of autumn to the beginning of March; they are then removed, and it rarely happens that any animal is admitted till the weather be dry, and the surface so firm as to bear their pressure, without being poached or injured.

5207. *In manuring upland meadows, the season, the sort, the quantity, and the frequency of application are to be considered.*

5208. *With regard to the season at which manure should be applied, a great difference of opinion prevails among the farmers of England.* In the county of Middlesex, where almost all the grass lands are preserved for hay, the manure is invariably laid on in October (*Middlesex Report*, p. 224.), while the land is sufficiently dry to bear the driving of loaded carts without injury, and when the heat of the day is so moderated as not to exhale the volatile parts of the dung. Others prefer applying it immediately after the hay-time, from about the middle of July to the end of August, which is said to be the "good old time" (*Com. to Board of Agriculture*, vol. iv. p. 138.); and if that season be inconvenient, any time from the beginning of February to the beginning of April. (*Dickson's Practical Agriculture*, vol. ii. p. 915.) It is, however, too common a practice to carry out the manure during frosty weather, when, though the ground is not cut up by the carts, the fertilizing parts of the dung are dissipated, and washed away by the snow and rains before they can penetrate the soil.

5209. *There is scarcely any sort of manure that will not be useful when laid on the surface of grass grounds; but, in general, those of the more rich dung kinds are the most suitable for the older sort of sward lands; and dung, in composition with fresh vegetable earthy substances, the more useful in the new leys or grass lands.* In Middlesex it is the practice of the best farmers to prefer the richest dung they can procure, and seldom to mix it with any sort of earthy material, as they find it to answer the best in regard to the quantity of produce, which is the principal object in view; the cultivators depending chiefly for the sale of their hay in the London markets. It is the practice to turn over the dung that is brought from London in a tolerable state of rottenness, once chopping it well down in the operation, so as to be in a middling state of fineness when put upon the land. It is, necessary, however, that it should be in a more rotten and reduced state when applied in the spring, than when the autumn is chosen for that purpose. (*Dickson's Practical Agriculture*, vol. ii. p. 915.)

5210. *Some interesting experiments have been made with different kinds of manure, for the purpose of ascertaining their effects, both in regard to the quantity and quality of the produce on different kinds of land.* Fourteen lots, of half an acre each, were thus manured, and the grass was made into hay, all as nearly alike as possible. The greatest weight of hay was taken from the lot manured with horse, cow, and butcher's dung, all mixed together, of each about an equal quantity. It lay in that state about two months; and was then turned over, and allowed to lie eight or ten days more, after which it was put on the land before it had done fermenting, and spread immediately. And to ascertain the quality of the produce of the different lots, a small handful from each was laid down on a dry, clean place, where there was little or no grass, and six horses were turned out to them one after another. In selecting the lots, there seems to have been little difference of taste among the horses; and all of them agreed in rejecting two lots, one of which had been manured with blubber mixed with soil, and the other with soot, in both instances laid on in the month of April preceding. (*Lancashire Report*, p. 130. *et seq.*)

5211. *The proportion of manure that is necessary must, in a great measure, depend upon the circumstances of the land, and the facility of procuring it.* In the district of London, where the manure is of a very good and enriching quality, from its being produced in stables and other places where animals are highly fed, the quantity is usually

from four or five to six or seven loads on the acre, such as are drawn by three or four horses, in their return from taking up the hay to town. (*Dickson's Pract. Agr.* vol. ii. p. 916.)

5212. Manure is laid on at intervals of time more or less distant, according to the same circumstances that determine the quantity of it. Though there are some instances of hay grounds bearing fair crops every year during a length of years, without any manure or any advantage from pasturage, except what the after-grass has afforded (*Marshall's Review of Reports to the Board of Agriculture*, p. 183. *Western Department*); yet, in general, manure must either be allowed every third or fourth year, in the land depastured one year, and mown the other; "or what is better, depasture two years and mow the third." (*Northumberland Report*, p. 111.) A succession of hay crops without manure, or pasturage, on meadows not irrigated, is justly condemned by all judicious farmers, as a sure means of impoverishing the soil.

5213. *Bog meadows* are the least valuable of any; they are of two kinds, peat bogs and earthy bogs. The first are situated in hollows or basins, which, from having no natural outlet for water, and not being so deep or so plentifully supplied with that element as to constitute lakes, become filled up with aquatic plants and mosses. By the decay of these after a certain time, and the drainage and culture of art, a surface of mossy soil is formed on which some of the inferior grasses may be sown or will spring up naturally. In warm moist climates and where the mould of the bog is rich, florin or Timothy grass may be found to answer; but in general the woolly soft grass and cock's-foot are resorted to, unless indeed lime be applied, or a coating of sand or earth, in which cases the clovers and better grasses will sometimes answer. These bogs are in general too soft for pasturing any other animals than sheep.

5214. *Earthy bog meadows* are situated either in hollows or on slopes. They are formed by an accumulation of water in the subsoil, which not finding a free passage in any one point, spreads under and filtrates upwards through a considerable extent of surface. The grasses on such meadows before they are drained, are chiefly of the sprot or juncus kind; but by draining the quality of these is improved, and better kinds appear. Such meadows yield a considerable produce of coarse hay; they abound chiefly in cold hilly districts devoted to breeding.

5215. *The culture and management of bog meadows* differs in nothing essential from that of the river kinds. A lighter roller is used in spring, the greatest care is taken in eating down the latter grass, whether by small cattle or sheep; and in some cases, in very dry weather in summer, the main drains are dammed up for a few weeks in order to stagnate the water, and supply the soil with moisture. No manure is ever given unless in the case of some cultivated peat bogs, which are dressed with earthy or saline mixtures.

5216. *As branches of culture common to every description of hay lands* may be mentioned, the hay-making, the application of the after-grass, and pasturage.

5217. *The making of natural or meadow hay* has been carried to greater perfection in the neighborhood of London than any where else, and may therefore, with great propriety, be recommended as an example to the rest of the kingdom. The following account of it is drawn from *Middleton's Agricultural Survey of Middlesex*.

5218. *When the grass is nearly fit for mowing*, the Middlesex farmer endeavors to select the best mowers, in number proportioned to the quantity of his grass and the length of time it would be advisable to have it in hand; which having done, he lets it out, either as piece work, or to be mown by the acre. In the latter way, each man mows from one acre and a half to an acre and three quarters per day; some there are who do two acres per day during the whole season. About the same time he provides five hay-makers (men and women, including loaders, pitchers, stackers, and all others), to each mower. These last are paid by the day, the men attending from six till six, but the women only from eight till six. For an extra hour or two in the evening, when the business requires dispatch, they receive a proportionate allowance.

5219. *The mowers usually begin their work at three, four, or five o'clock in the morning*, and continue to labor till seven or eight at night; resting an hour or two in the middle of the day. Every hay-maker is expected to come provided with a fork and a rake of his own; nevertheless, when the grass is ready, and laborers scarce, the farmer is frequently obliged to provide both, but for the most part only the rake. Every part of the operation is carried on with forks, except clearing the ground, which is done with rakes; and loading the carts, which is done by hand.

5220. *First day.* All the grass mown before nine o'clock in the morning is tedded, in which great care is taken thoroughly to loosen every lump, and to strew it evenly over all the ground. By this regular method of tedding grass for hay, the hay will be of a more valuable quality, heat more equally in the stack, consequently not so liable to damage or fire; will be of greater quantity when cut into trusses, and will sell at a better price; for when the grass is suffered to lie a day or two before it is tedded out of the swath, the upper surface is dried by the sun and winds, and the interior part is not dried, but withered, so that the herbs lose much, both as to quality and quantity, which are very material circumstances. Soon after the tedding is finished, the hay is turned with the same degree of care and attention; and if, from the number of hands they are able to turn the whole again, they do so, or at least as much

of it as they can, till twelve or one o'clock, at which time they dine. The first thing to be done after dinner, is to rake it into what are called single wind-rows; and the last operation of this day is to put it into grass-cocks.

5221. *Second day.* The business of this day commences with tedding all the grass that was mown the first day after nine o'clock, and all that was mown this day before nine o'clock. Next, the grass-cocks are to be well shaken out into staddles (or separate plats) of five or six yards diameter. If the crop should be so thin and light as to leave the spaces between these staddles rather large, such spaces must be immediately raked clean, and the rakings mixed with the other hay, in order to its all drying of an uniform color. The next business is to turn the staddles, and after that, to turn the grass that was tedded in the first part of the morning, once or twice, in the manner described for the first day. This should all be done before twelve or one o'clock, so that the whole may lie to dry while the work-people are at dinner. After dinner, the first thing to be done, is to rake the staddles into double wind-rows; next, to rake the grass into single wind-rows; then the double wind-rows are put into bastard-cocks; and lastly, the wind-rows are put into grass-cocks. This completes the work of the second day.

5222. *Third day.* The grass mown and not spread on the second day, and also that mown in the early part of this day, is first to be tedded in the morning, and then the grass-cocks are to be spread into staddles as before, and the bastard-cocks into staddles of less extent. These lesser staddles, though last spread, are first turned, then those which were in grass-cocks; and next the grass is turned once or twice before twelve or one o'clock, when the people go to dinner as usual. If the weather has proved sunny and fine, the hay which was last night in bastard-cocks, will this afternoon be in a proper state to be carried; but if the weather should, on the contrary, have been cool and cloudy, no part of it probably will be fit to carry. In that case, the first thing set about after dinner, is to rake that which was in grass-cocks last night into double wind-rows; then the grass which was this morning spread from the swaths into single wind-rows. After this, the hay which was last night in bastard-cocks, is made up into full-sized cocks, and care taken to rake the hay up clean, and also to put the rakings upon the top of each cock. Next, the double wind-rows are put into bastard-cocks, and the single wind-rows into grass-cocks, as on the preceding days.

5223. *Fourth day.* On this day the great cocks, just mentioned, are usually carried before dinner. The other operations of the day are such, and in the same order, as before described, and are continued daily until the hay harvest is completed.

5224. *As general rules,* the grass should, as much as possible, be protected both day and night, against rain and dew, by cocking. Care should also be taken to proportion the number of hay-makers to that of the mowers, so that there may not be more grass in hand at any one time, than can be managed according to the foregoing process. This proportion is about twenty hay-makers (of which number twelve may be women), to four mowers; the latter are sometimes taken half a day to assist the former. But in hot, windy, or very drying weather, a greater proportion of hay-makers will be required than when the weather is cloudy and cool. It is particularly necessary to guard against spreading more hay, than the number of hands can get into cocks the same day, or before rain. In showery and uncertain weather, the grass may sometimes be suffered to lie three, four, or even five days in swath. But before it has lain long enough for the under side of the swath to become yellow (which, if suffered to lie long, would be the case), particular care should be taken to turn the swaths with the heads of the rakes. In this state, it will cure so much in about two days, as only to require being tedded a few hours when the weather is fine, previous to its being put together and carried. In this manner, hay may be made and put into the stack at a small expense, and of a moderately good color; but the tops and bottoms of the grass are insufficiently separated by it.

5225. *The hay tedding machine* has been invented since Middleton described the hand process as above. This machine (*fig. 337.*) is found to be a most important saving of manual labor. It is computed that a boy and horse with the machine will ted as much in an hour as twelve or fifteen women. The hay-rake, which may be added to the same axle when the tedder is removed, is also an equal saving, and a requisite accompaniment to it; as where few or no women are kept for tedding, there must necessarily be a deficiency of rakers. These machines are coming into general use near London, where the price of manual labor is high and hands sometimes scarce. They are also finding their way among the proprietors of extensive parks in all parts of the country, as saving much labor in making hay from natural pasture.

5226. *There are no hay-stacks* more neatly formed, nor better secured, than those made in Middlesex. At every vacant time, while the stack is carrying up, the men are employed in pulling it, with their hands, into a proper shape; and, about a week after it is finished, the whole roof is properly thatched, and then secured from receiving any damage from the wind, by means of a straw rope, extended along the eaves, up the ends, and on each side of the ridge. The ends of the thatch are afterwards cut evenly below the eaves of the stack, just of sufficient length for the rain-water to drip quite clear of the hay. When the stack happens to be placed in a situation which may be suspected of being too damp in the winter, a trench, of about six or eight inches deep, is dug round, and nearly close to it, which serves to convey all the water from the spot, and renders it perfectly dry and secure.

5227. *During the hay harvest* it is of great advantage to the farmer, to give constant personal attendance on every party, directing each operation as it goes on. The man who would cure his hay in the best manner, and at a moderate expense, must not only urge the persons who make the hay, the men who load the waggons, and those who make the stack, but he should be on the alert, to contrive and point out the manner in which every person may do his labor to the most advantage. Unless he does this, one

rascality of the people in his hay-field will be of no material use to him; and if he should be absent for an hour or more, during that time, little or nothing will be done. The farmers of Middlesex engage many hay-makers: some of them have been known to employ two or three hundred; such men find it necessary to be on horseback, and the work-people find them sufficient employment. A man of energy will make the most of every hour, and secure his hay while the sun shines: one of an opposite description lounges his time away, and suffers his hay to be caught in the rain, by which it is frequently half spoiled. Or if the latter should have the good fortune of a continuance of dry weather, his hay will be a week longer in the field than his neighbor's, and the sap of it dried up by the sun.

5228. *The waste of grass, on being dried into hay*, is supposed to be three parts in four by the time it is laid on the stack; it is then further reduced, by heat and evaporation, in about a month, perhaps one-twentieth more, or 600 lb. of grass are reduced to 95 lb. of hay; and between that and 90, it continues through the winter. From the middle of March till September, the operations of trussing and marketing, expose it so much to the sun and wind, as to render it considerably lighter, probably 80; that is, hay which would weigh 90 the instant it is separated from the stack, would waste to 80 (in trussing, exposure on the road, and at market for about 24 hours), by the time it is usually delivered to a purchaser. During the following winter, the waste will be little or nothing. It is nearly obvious, that the same hay will weigh on delivery 80 in summer, and 90 in winter. From this circumstance, and others which relate to price, a farmer may determine what season of the year is the most advisable for him to sell his hay.

5229. *In making the hay of bog meadows*, considerable care is requisite both from the inferiority of the climates where such bogs abound, and from the nature of the grasses they produce. In some cases, the grass is of so soft a quality, that it is difficult to convert it into hay. To prevent its being consolidated in the cocks, it must be frequently opened up, and when the weather permits, completely exposed to the sun and wind; this sort of grass being only capable of sustaining a very moderate degree of fermentation.

5230. *When the natural herbage is of a coarser description*, it may be put into small cocks, in rather a green or damp state, so as to go through the progress of "a sweating," or slight fermentation. The woody fibres in coarse hay, are thus rendered more palatable and nutritious, while its condition for becoming fodder, is considerably improved: but when any warmth becomes perceptible, if the weather will permit it, the hay should be spread out, and put into large cocks the moment it is in a dried state.

5231. *In the moister pastoral districts*, in the north-west parts of Scotland, hay-barns are necessary, the construction of which is as open as possible, for the purpose of drying, as well as preserving the hay. In some of these districts, a curious device has been fallen upon, of making the hay, when dried, into ropes of two fathoms in length, and then twisted twofold. Being thus compressed, less room is required in the barn, and in this shape, it is carried, with greater facility, to distant glens, for the use of cattle during stormy weather.

5232. *In making florin hay* (if hay it may be called, which is never dried) it is merely cut and put into small cocks, from which it is commonly taken as wanted. When it is to be put into larger cocks, it must be proportionally better dried. The stolones of this grass being remarkably vivacious, cannot easily be so dried as to admit of stacking in large bodies.

5233. *The salting of hay*, at the time of stacking, has been practised in Derbyshire and in the North Riding of Yorkshire. The salt, particularly when applied to the crop of rouse, or when the first crop has received much rain, checks the fermentation, and prevents moulding. If straw be mixed with the hay, the heating of the stack is still further prevented, by the straw imbibing the moisture. Cattle will eat, not only such salted hay, but even the straw mixed with it, more eagerly than better hay not salted, and also thrive as well upon it. The quantity recommended is, a peck of ground rock salt to a ton of hay. By this application, hay that had been flooded, was preferred by cattle to the best hay that had not been salted.

5234. *To make hay-tea*. Boil at the rate of a handful of hay to three gallons of water, or if the water be poured boiling hot on the hay, it will answer nearly as well. Give it to the cattle and horses to drink when cold; or if the cattle and horses are anyways ill, and under cover, give it them blood warm. This drink is so extremely nutritive, that it nourishes the cattle astonishingly, replenishes the udders of the cow with a prodigious quantity of milk, makes the horse stale plentifully, and keeps him healthy and strong; and by this method one truss or hundred of hay will go as far as eight or ten otherwise would do. The cattle and horses do not seem to like it at first; but if they are kept till they are very thirsty, they will drink freely of it ever afterwards. The hay after being used as before-mentioned and dried, may be used as litter for horses and cattle; it will make very good manure, and save straw, which is a considerable advantage, especially where there is a scarcity of that article. (*Davis's Rep. of Wills.*)

5235. *The after-grass on all meadows* is generally fed off; on firm lands, and in the dry season, by either sheep or heavy cattle; but in the winter only by sheep, unless the soil is so dry as not to be injured by the feet of cows or horses. The feet of the latter, are

much less injurious than those of the former; but their bite being closer is more apt to tear up the plants, than the bite of the horned tribe. In Middlesex cattle are generally removed from meadow-lands in November; horses in the month following, and sheep allowed to remain till February. In Lincolnshire, Leicestershire, and on many river-meadows, every description of stock is allowed to remain till April, and sheep to May. In some districts, the whole of the after-growth is preserved from every species of stock till the following May, when it is fed off for sheep: but this greatly retards the hay crop for that year. It is evident that a good deal must depend on the farmer's other resources for keep to his stock.

5236. *The after-grass, where manure is very abundant, is sometimes made into hay or r  uen, a soft and not very nutritive food, given to cows or sheep; but this is reckoned a bad practice, even in the neighborhood of London, where manure may be had in abundance. It is also the usage of some to leave the after-grass on the ground without being eaten till spring, when it is said to be preferable, for ewes and lambs, to turnips, cabbages, or any other species whatever of what is termed spring-feed. This mode of management, which is strongly recommended by Young, and in some cases by Marshal also, is unknown in the north, where, though it is, in many instances, found beneficial, with a view to an early spring growth, not to eat the pasture too close before winter, it would be attended with a much greater loss of herbage, than any advantage in spring could compensate, to leave the after-growth of mown grounds untouched till that season.*

5237. *A system of alternate mowing and feeding is practised on some hay lands, partly to save labor and manure, and partly to subdue mosses and coarse grasses. On some soils even rich grass lands, when annually mown, become subject to weeds; for it tends to encourage moss, and gives advantage to the stronger rooted grasses, which gradually change, and deteriorate the nature and quality of the herbage. The bottom becomes thin, the white clover disappears, and coarser plants occupy the ground. When this takes place, the pasture should be fed, instead of being mown, for the space of two or three years, until the weeds have been subdued, and the finer grasses re-appear.*

5238. *By adopting the plan of mowing and feeding alternately, a farmer, it is said, may go on longer without the application of manure, but his fields, in the end, will be ruined by it. It is contended, that to maintain a proper quantity of stock, the land must be accustomed to keep it, particularly in the case of sheep; that where land has been used to the scythe, if manured for pastures, it will often produce more grass, but that grass will not (*ceteris paribus*) support so much stock, nor fatten them nearly so well; and that old pasture will not produce so much hay as land that has been constantly mowed; for each will grow best as they have been accustomed to grow, and will not readily alter their former habits. On the other hand, it is asserted, that many experienced farmers prefer the system of feeding and mowing alternately, as they find, that under that system, the quality and quantity of the hay has been improved; and the pasturage, in the alternate year, has been equally sweet and productive.*

SECT. II. *Of permanent Pastures.*

5239. *Permanent pastures may be divided into two kinds: rich or feeding lands; and hilly or rearing pastures. Under the former, we may comprehend all old rich pastures that are capable of fattening cattle; and under the second, such as are adapted to rearing them only, or are more advantageously depastured with sheep.*

SUBSECT. 1. *Of rich or feeding Pastures.*

5240. *Feeding pastures may include such as are equally fit for hay-lands, or for being converted to arable husbandry; their characteristic being, that they are used for feeding stock, and keeping working animals and milk-cows in good condition. We have mentioned in a former chapter, that pasturage for one, two, or more years, is frequently interposed in the course of cropping arable land, to prevent that exhaustion of the soil which is commonly the consequence of incessant tillage crops. The same culture and management that is recommended here for rich grass lands, is equally applicable to them; there being no difference, excepting that the latter are generally considered less suitable for fattening heavy stock, such as large oxen, than rich old turf.*

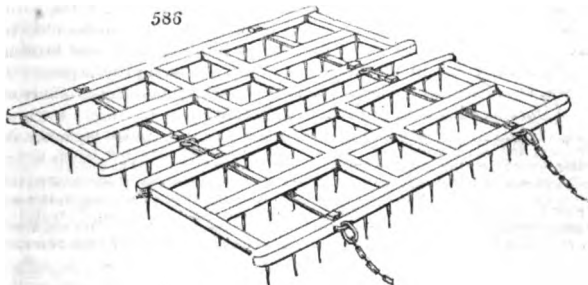
5241. *The culture and management of feeding pastures, whether of a few years or perpetual duration, may be considered in regard to those necessary operations that have been already noticed, under the former section, — such as the extirpation of weeds and noxious shrubs, clearing away ant and mole-hills, the application of manure, the time of stocking, the number of the animals, and whether all should be of one or of different species, — the extent of the enclosures, and the propriety of eating the herbage close, or leaving it always in a rather abundant state; all these are questions which it is scarcely possible to decide in a satisfactory manner, by the application of general rules. They can only be resolved, with any pretensions to utility, by a reference to the particular circumstances of each case; for the practice of one district, in regard to these and other points, will be*

found quite inapplicable to others where the soil and climate, and the purposes to which the pastures are applied, are materially different.

5242. *The weeding of pastures* should be regularly attended to. Weeds in pastures injure the farmer by the ground they occupy, the seeds they disperse, and sometimes, by influencing the quality of milk, or the health of the cattle. Small creeping weeds cannot be removed on the large scale of a farm; but large perennial plants, such as the dock, fern, nettle; and biennials, such as the thistle, ragweed, together with rushes and coarse tufts, or tussocks of tall oat-grass, should never be permitted to shoot up into flower. The dock ought to be taken out by the root with the dock-weeder, and the others cut over with spadlets or spuds. Nettles may be mown over, as may some other weeds, and some descriptions of rushes and fern is most effectually killed by bruising or twisting asunder the stem, when the frond or herb is nearly fully expanded. Smaller weeds may be mown, and this operation should never be deferred later than the appearance of the flowers. Where the sloe-thorn forms part of the enclosure-hedges, or the English elm, hoary poplar, and some other trees, grow in or around the field, they are apt to send up suckers; these should be pulled up, otherwise they will soon become a serious nuisance. In some parts of England, especially in the central districts, the hedge wastes, from the spread of the sloe-thorn and creeping rose (*Rosa arvensis*), are sometimes six or ten yards in width.

5243. *To prevent the growth of mosses* is one of the greatest difficulties in the management of old pasture lands; by these the finer species of grasses are apt to be overwhelmed, and the coarse sorts only remain. Drainage, and the use of rich composts, are in this case necessary. Harrowing and cross harrowing with a common harrow, or with what are called grass harrows (fig. 586.), which go from one to two inches deep, with a sprink-

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ling of grass-seeds afterwards, and some lime or well prepared compost, are the most likely means of destroying the moss, and improving the pasture. Feeding sheep with oil cake, and allowing them to pasture on the land, has also been found effectual for the destruction of moss, and bringing up abundance of grass. But the radical remedy is to plough up such grass lands upon the first appearance of moss, or before it has made any considerable progress, and sow them with corn.

5244. *The removal of ant and mole-hills* should be attended to during the whole summer. The manner of destroying ants has already been described; mole-hills spread on grass lands may be considered as of service rather than otherwise. These operations, together with weeding, and spreading the manure dropped by the larger stock, should go on together at intervals during the whole summer.

5245. *The application of manures* to grazing lands, which not being used as hay grounds afford no means of supply, may certainly be considered a preposterous practice, and one that must be ruinous to the other parts of a farm; yet in *The Code of Agriculture* it is stated, that "to keep grass in good condition, a dressing of from thirty to forty cubic yards or cart-loads of compost, is required every four years. The application of unmixed putrescent manure will thus be rendered unnecessary, which ought at least to be avoided, in meadows appropriated for the feeding of dairy cows, from its affecting the quality of the milk." (p. 476.) Grass lands kept at an expense of this kind will seldom, it is believed, be found to remunerate a farmer sufficiently. The same thing is recommended (probably from inadvertence or mere following the tract of preceding writers), in *Dickson's Practical Agriculture*, vol. ii. p. 953. But, excepting the dung dropped by the pasturing animals, which should always be regularly spread from time to time, it may be laid down as a rule of pretty extensive application, that if grass lands do not preserve their fertility under pasturage, it would be much better to bring them under tillage for a time, than to enrich them at the expense of land carrying crops of corn. (*Sup. &c. art. Agr.*)

5246. *Treading or stacking* on the field, or carrying to be consumed there during winter, the provender that ought to have furnished disposable manure for the use of the farm at large, is another practice not less objectionable. It is to no purpose that such a wasteful practice is defended, on dry light soils which are alleged to be thus benefited by the treading of the cattle. (*Marshall's Rural Economy of Yorkshire*, vol. ii.

p. 131.) During the frequent and heavy falls of rain and snow in winter, there is scarcely any land so dry as not to be injured by the treading of heavy cattle; and were there any thing gained in this respect by this management, it would be much more than counterbalanced by the loss of a great part of the manure, from the same cause. The able writer to whom we have just now referred, very properly disapproves of carting on manure in winter; and for the same reason, namely, the loss of it, which must necessarily be the consequence, he ought to have objected to foddering on the land, or teathing at that season. The practice, however, is but too common in those districts, both in South and North Britain, where the knowledge of correct husbandry has made but little progress. It is equally objectionable, whether the fodder be consumed on meadows where it grew, or on other grass lands. The fodder should, in almost every instance, be eaten in houses or fold-yards, instead of the dung being dropped irregularly over the surface; or, as must be almost always the case, accumulated in some spots sheltered by trees and hedges, to which the animals necessarily resort during the storms of winter.

5247. *The time of stocking pastures in spring, must evidently be earlier or later, according to the climate, and in the same climate according to the season; and the state of growth, which it is desirable that the grass should attain before being stocked, must, in some degree be determined by the condition and description of the animals to be employed in consuming it; whether they are only in a growing state or approaching to fatness; whether milk cows or sheep, or a mixture of animals of different species.* It conveys no very precise idea respecting these points, though the remark itself is just, to say that the herbage should not be allowed to rise so high as to permit the coarser plants to run to seed; and that it is bad management to suffer store stock to be turned upon a full bite. (*Marshal's Yorkshire*, vol. ii. p. 129.) The great objects to be aimed at are, that the stock, of whatever animals it may consist, should be carried forward faster or slower, according to the purposes of their owner; and that no part of the herbage should be allowed to run to waste, or be unprofitably consumed. But nothing but careful inspection of the land and of the stock, from time to time, can enable any grazier to judge with certainty what are the best measures for attaining these objects. "Fattening cattle," says Marshal, "which are forward in flesh, and are intended to be finished with grass, may require a full bite at first turning out. But for cows, working oxen, and rearing cattle, and lean cattle intended to be fatted on grass, a full bite at the first turning out is not requisite. Old Lady-day to the middle of April, according to the progress of spring, appears to me, at present, as the best time for shutting up mowing grounds and opening pastures." (*Marshal's Yorkshire*, vol. ii. p. 152, 153.)

5248. *In regard to the state of the growth of pastures when first stocked, some distinction should be made between new leys and old close swards. To prevent the destruction of the young plants, whether of clover or other herbage, on the former description of pasture, which would be the consequence of stocking them too early, especially with sheep, they should be allowed to rise higher than would be necessary in the case of old turf; and to secure their roots from the further injury of a hot summer, it is advisable not to feed them close in the early part of the season, and probably not at any time throughout the whole of the first or second season, if the land is to be continued in pasture. The roots of old and firm sward, on the other hand, are not in so much danger, either from close feeding or from the heats of summer; and they are in much less danger from the frosts and thaws of winter.*

5249. *With regard to the stock which should be employed, all soils rather moist and of such a quality, as is the case with rich clays, as to produce herbage suited to the fattening of cattle, will, in general, be more advantageously stocked with them than with sheep; but there can be no other rule for the total exclusion of sheep, than the danger of the rot; nor any other general rule for preferring one kind of stock to another, than their comparative profits. (Sep. art. Agr.)*

5250. *Whether the stock should be all of one or of different kinds, is another question to be discussed. With regard to a mixed stock, the sentiments and practice of the best graziers seem to be in its favor. "It is generally understood that horses and cattle intermixed will eat grass cleaner than any species will alone, not so much from their separately affecting different grasses, as from the circumstance of both species disliking to feed near their own dung." (Marshal's Yorkshire, vol. ii. p. 154.) "Some few graziers follow the old custom of keeping only one kind of stock upon the same ground, whilst others, we think, with more propriety, intermix with oxen and cows a few sheep, and two or three colts in each pasture, which both turn to good account, and do little injury to the grazing cattle. In some cases sheep are a real benefit, by eating down and destroying the ragwort (*Senecio jacobææ*), which disgraces some of the best pastures of the county, where oxen only are grazed." (Northumberland Report, p. 126.) And in Lincolnshire, where grazing is followed to a great extent, and with uncommon success, as well as in most other districts, the practice seems to be almost invariably, to keep a mixed stock of sheep and cattle on the same pasture (Lincolnshire Report, p. 174.), in proportion varying with the nature of the soil and the quality of the herbage.*

5251. *To estimate the number of animals that may be depastured on any given extent of ground, is obviously impossible, without reference to the particular spot in question; and the same difference exists with regard to the propriety of feeding close, or leaving the pastures rough, that prevails in most other parts of this subject. Though there be less in stocking too sparingly, the more common and dangerous error is in overstocking, by which the summer's grass is not unfrequently entirely lost.*

5252. *With respect to the size of enclosures, small fields are much to be preferred to large ones, for heavy stock. Besides the advantages of shelter, both to the animals and the herbage, small fields enable the grazier either to separate his stock into small parcels, by which means they feed more at their ease, or to give the best pastures to that portion of them which he wishes to come earliest to market. The advantages of moderate sized enclosures are well known in the best grazing counties; but the subdivisions are in some*

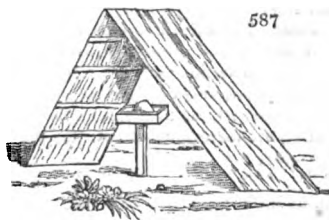
instances much more minute than is consistent with the value of the ground occupied with fences, or necessary to the improvement of the stock. In all cases, says Marshal, where fattening cattle or dairy cows make a part of the stock, and where situation, soil, and water will permit, every suit of grazing grounds ought, in my idea, to consist of three compartments. One for head stock (as cows or fattening cattle); one for followers (as rearing and other lean stock); and the third to be shut up to freshen for the leading stock. (*Marshal's Yorkshire*, vol. ii. p. 158.)

5253. *Large enclosures* are in general best adapted for sheep. These animals are not only impatient of heat and liable to be much injured by flies, in small pastures often surrounded by trees and high hedges, but they are naturally, with the exception perhaps of the Leicester variety, much more restless and easily disturbed than the other species of live stock. "Sheep," says Lord Kaimes, "love a wider range, and ought to have it, because they delight in short grass: give them eighty or ninety acres, and any fence will keep them in; confine them to a field of seven or eight acres, and it must be a very strong fence that keeps them in." (*Gentleman Farmer*, p. 203.) Though fields so large as eighty or ninety acres, can be advisable only in hilly districts, yet the general rule is nevertheless consistent with experience, in regard to all our least domesticated varieties.

5254. *With respect to the propriety of eating the herbage close, or leaving it rather in an abundant state*, an eminent agriculturist observes, that there seems to be a season, some time during the year, when grass lands, particularly old turf, should be eaten very close, not merely for the sake of preventing waste, but also for the purpose of keeping down the coarser kinds of plants, and giving to the pastures as equal and fine a sward as possible. The most proper period must partly depend upon the convenience of the grazier; but it can hardly be either immediately before the drought of summer or the frost of winter. Some time in autumn, when the ardent heat of the season is over, and when there is still time for a new growth before winter, may be most suitable for the land itself, and generally also for the grazier, his fat stock being then mostly disposed of, or carried to the after-grass of mown grounds. The sweeping of pastures with the scythe, may be employed as a substitute for this close feeding; the waste and labor of which, however, though they be but trifling, it does not seem necessary to incur on rich grazing lands, under correct management. (*Sup. E. Brit. art. Agr.*)

5255. *Fogging pasture lands* is a practice which is sometimes adopted in districts where there is a scarcity of winter food. Under that system, fields in pasture are shut up early in May, and continued in that state till November or December, when the farmer's stock is turned in, and continue to pasture, till the May succeeding. Such management, however, can only be advisable on a soil of the driest nature, which will not be injured by poaching in the wettest seasons. It is practised in a few places in Cardiganshire; but is considered by Thos. Johnes, Esq. of Harrod, as being the result of necessity, the farmers not being able to bring sufficient stock to eat it down in season, when its nutritive powers are in their best state.

5256. *Water* should be provided for every field under pasture; and also shelter and shade, either by a few trees, or by a portable shed, which may be moved with the stock from one enclosure to another. Where there are no trees, rubbing posts are also a desirable addition. In Germany they have portable sheds which are employed both in summer and winter, and generally with a piece of rock-salt fixed to a post for the cattle to suck at. (*fig. 587.*)



SUBJECT. 2. Of Hilly and Mountainous Pastures.

5257. *Hilly pastures* include such low hills as produce fine short herbage, and are with much advantage kept constantly in pasture, though they are not altogether inaccessible to the plough; as well as such tracts as, from their acclivity and elevation, must necessarily be exclusively appropriated to live stock. The former description of grass lands, though different from the feeding pastures, of which we have just treated, in respect of their being less convenient for tillage management, are nevertheless in other circumstances so nearly similar, as not to require any separate discussion. These low hills are for the most part occupied with sheep, a very few cattle being sometimes depastured towards their bases; and they frequently comprise herbage sufficiently rich for fattening sheep, together with coarser pastures for breeding and rearing them.

5258. *In regard to the management of upland pastures*, of the rules which judicious farmers practise, the following deserve to be selected. To enclose those pastures, as the same extent of land, when sheltered, and properly treated, will feed a greater

quantity of stock, and to better purpose, than when in an open and exposed state. Not to overstock upland pastures; for when this is done, the cattle are not only starved, and the quantity of herbage diminished, but the soil is impoverished. When the pasture ground is enclosed and subdivided, so as to admit of it, the stock ought to be shifted from one enclosure to another, at proper intervals; giving the first of the grass to the fattening, in preference to the rearing stock. This practice tends to increase the quantity of grass, which has thus time to get up; and the ground being fresh and untainted, when the stock returns to it, more especially if rain has fallen, they will feed with greater appetite and relish. The dung dropt by the stock, while feeding, should be spread about, instead of its being suffered to remain, in a solid body, on the place where it was dropt. Where the large and the smaller kinds of stock are to be fed on the same pastures, the larger species should have the first bite; and it is not thought by some advisable to pasture land with a mixed collection of different species of live stock, unless the field be extensive, or unless the herbage varies in different parts of the field. It is generally found, that the grass produced by the dung of cattle or horses, is injurious to sheep, producing grass of too rich a quality for that species of stock. There is no mode by which such pastures are more effectually improved, than by the application of lime, either spread upon the surface, or mixed with the soil. In the latter case, it is essential, that the lime should be mixed with the surface soil only; as lime is apt to sink, if covered deep by the plough. The coarse grasses would, in that case, regain possession of the soil, and the dung afterwards deposited by the cattle, will not enrich the land in the same manner as if the lime had been incorporated with the surface only. (*Code*.)

5259. *Mountainous pastures*, from which the plough is altogether excluded, have been commonly classed among waste lands; even such of them as bear herbage by no means of inconsiderable value; as well as heaths and moors, with patches of which the green pastures are often chequered. The general term wastes, is therefore a very indefinite expression; and, indeed, is not unfrequently made to comprehend all that extensive division of our territory that neither produces corn nor rich herbage. Yet it is on such tracts that by far the greater part of our butcher's meat and wool is grown, and not a little of the former fully prepared for the market. Foreigners and superficial readers at home must accordingly be greatly mistaken, if they imagine that what are called *wastes*, by the Board of Agriculture, and other writers on rural economy, are really altogether unproductive; and it would still be a grosser error to believe, that all those wastes owe their continuance to neglect or mismanagement; and that any exertions of human industry can ever render the greater part of them, including all the mountainous tract of Great Britain, more valuable than they are at present, without a much greater expenditure of capital, than, under almost any circumstances, they could possibly return. (*Sup. art. Agr.*)

5260. *The chief improvements of which mountainous pastures are susceptible*, are those of draining and sheltering by plantations. Some parts might probably be enclosed by strips of plantation between stone walls, or by stone walls alone; but as the stock on mountain pastures are generally under the care of a herdsman, the advantages of change of pasture and alternate eating down and saving or sparing the grass, by keeping out the cattle, are obtainable without the use of fields.

SECT. III. *Of the Improvement of Grass Lands, by a temporary Conversion to Tillage.*

5261. *The practice of breaking up grass lands*, either with a view to their being soon after restored to that state, or to their permanent retention in aration, has occasioned much discussion, and even attracted the attention of the Legislature, and the Board of Agriculture. In *The Code of Agriculture*, it is stated, that a "much larger proportion of the united kingdom, than is at present so cultivated, might be subject to the alternate system of husbandry, or transferred from grass to tillage, and then restored to grass. Much of the middling sorts of grass lands, from 200 to 400 feet above the level of the sea, is of this description; and all well-informed husbandmen, and friends to the general prosperity of the country, regret, that such lands are left in a state of unproductive pasturage, and excluded from tillage.

5262. *A very extensive inquiry* was made, in consequence of a requisition from the House of Lords to the Board of Agriculture, in December 1800, "into the best means of converting certain portions of grass lands into tillage, without exhausting the soil, and of returning the same to grass, after a certain period, in an improved state, or at least without injury;" and the information collected by the Board, upon that subject, is in the highest degree satisfactory and important.

5263. On this subject *the opinion of one of our first writers* is, "that though it be impossible to deny that much grass land in England would be more productive, both to the proprietor and occupier, under a good course of cropping, than under pasture; yet it is no less certain, that there are large tracts of rich grazing land, which, in the present state of the demand for the produce of grass lands, and of the law of England, with regard to tithes, cannot be employed more profitably for the parties concerned, than in pasture. The interest which the Board of Agriculture has taken in this question, with

a view to an abundant supply of corn for the wants of a rapidly increasing population, seems, therefore, not to have been well directed. Instead of devoting a large portion of their volumes to the instruction of farmers, regarding the best method of bringing grass lands into tillage, and restoring them again to meadow or pasture, without deterioration; the first thing required was, to attempt removing the almost insuperable obstruction of tithes, by proposing to the legislature an equitable plan of commutation. If some beneficial arrangement were adopted on this head, there is no reason to doubt, that individual interest would soon operate the wished-for change; and that all grass lands capable of yielding more rent and profit under tillage than under pasture, would be subjected to the plough, as fast as the demands of the population might require. (*Sup. E. B. art. Agr.*)

5264. In giving the essence of the information collected by the Board, we shall first state the opinions as to such grass lands as should not be broken up, and next the directions for breaking up and laying down the others.

SUBSECT. 1. Of Grass Lands that ought not to be broken up by the Plough.

5265. There are various sorts of grass lands that ought not to be broken up; as water meadows; salt marshes; lands apt to be overflowed; lands near large populous towns, where the produce of grass land is always in demand, and consequently dear; and low lying tracts, in the valleys of mountainous countries, particularly in chalky districts where old meadow land is scarce, and where a portion of it, to raise early and late food for stock, gives a great additional value to the adjoining upland. But whether rich lands, which have long remained in grass, and continue productive, should ever be converted into tillage, is a question respecting which a great diversity of opinion has been entertained.

5266. The lands considered as best adapted for permanent pasture, are of three kinds: strong tenacious clays, unfit for turnips, or barley, which are said to improve the more, the longer they are kept under a judicious system in grass; soft clayey loams, with a clayey or marly bottom or substratum; and, rich sound deep-soiled land, or vale land, enriched by nature at the expense of the higher grounds, generally lying in a situation favorable with respect to climate.

5267. The advantages of such pastures are represented in the strongest light. It is affirmed that they feed cattle to a greater weight; that they are not so easily scorched by the summer's drought; that the grasses are more nutritive both for sheep and cattle; that milch cows fed upon them give richer milk, and more butter and cheese; that the hoofs of all animals pastured on them are much better preserved; that they produce a greater variety of grasses; that when properly laid down, they yield a succession of pasture throughout the whole season; that the herbage is sweeter, and more easily digested; and that they return an immense produce at a trifling expense.

5268. To break up lands possessing these advantages, it is said, can only be justified by the most urgent public necessity, and to prevent the horrors of famine. The real value of such lands will appear, by considering their rent and produce. The grass lands in Lincolnshire are accounted the richest in the kingdom. The rents are various, from 1*l.* 15*s.* to 3*l.* per acre, and the value of the produce from 3*l.* per acre to 10*l.* This produce arises from beef, mutton, and wool, and is obtained, subject to little variation from the nature of the seasons, and at a trifling expense. The stock maintained per acre on the best grazing lands, surpasses what could be fed by any arable produce. It is not at all uncommon to feed at the rate of from six to seven sheep in summer; and about two sheep in winter. The sheep when put on the grass may weigh from 18 lbs. to 20 lbs. per quarter, and the increase of weight would be at the rate of 4 lbs. per quarter, or 16 lbs. per sheep. But suppose in all only 100 lbs. at 8*d.* per pound, that would amount to 3*l.* 17*s.* 10*d.* The wool would be worth about two guineas more, besides the value of the winter keep, and the total may be stated at about seven pounds per acre, got at little expense. Such lands, it is evident, cannot be better employed than in feeding stock.

5269. Grass land on tenacious clays and heavy loams, when brought in a succession of years, or perhaps of ages, into a state of great productiveness, cannot be ploughed without the risk of great injury, and are more profitable in the production of herbage than they could be in the production of grain.

5270. Grass on deep-soiled sound vale lands, would be productive of corn if ploughed; but would probably be injured by cultivation; from their texture being altered, and rendered unduly loose and open by tillage; from the native plants being more or less destroyed or enfeebled; and from the great decomposition and waste of the principles of fertility resident in the soil.

5271. The extent of these descriptions of land, however, is not so great, that the advantages of breaking them up could probably ever be a national object, or worth the risk of injuring their future productiveness in grass. But there are pasture lands of an inferior sort which are too apt to be confounded with those already described, and res-

pecting the propriety of occasionally appropriating them to arable culture, there can hardly be a doubt. Such lands do not depend upon their intrinsic fertility, but upon annual supplies of manure derived from the arable land in their neighborhood.

SUBJECT. 2. Of the Advantages and Disadvantages of breaking up Grass Lands.

5272. *The advantages of breaking up grass lands, not of the richest quality, will appear by a comparison of their produce with that of arable lands.* From the inquiry of the Board of Agriculture, it appears that an acre of clover, tares, rape, potatoes, turnips, cole, or cabbages, will furnish at least thrice as much food as the same acre would have done had it remained in pasture of a medium quality; and consequently, that the same extent of land would maintain at least as much stock as when in grass; besides producing every other year a valuable crop of corn; and this, independently of the value of the straw, which, whether consumed as litter, or as food for cattle, will add considerably to the stock of manure. It follows that with the exception of rich pastures, arable land is, on an average, superior to grass land with respect to furnishing articles of human food in the proportion of three to one; and consequently every piece of land, unnecessarily kept in grass, the produce of which will only maintain one person, is depriving the community of food, capable of maintaining two additional members.

5273. *The principal objection to the conversion of old turf into arable land, arises from an alleged inferiority in the new when compared to the old herbage; a complaint which probably originates either from the improper choice of seeds, or from giving them in too small quantities, thus favoring the growth of weeds.* A gentleman who had a large farm, principally consisting of strong rich clay, (every field of which, with hardly an exception, he occasionally broke up) was accustomed to lay them down with a crop of barley, and to sow fourteen pounds of white clover, a peck of rib-grass, and three quarters of hay-seeds per acre. By this liberal allowance of seed, he always secured a thick coat of herbage the first year, which differed from old pasture only in being more luxuriant. Such lands, therefore, under judicious management, will rarely be injured by the plough. When laid down from tillage into grass, they may not carry for the first year or two, such heavy cattle as they would afterwards, but they will support more in number, though of a smaller size, and bring a greater weight of butcher meat to market. It is often desirable to keep one or two moderate-sized enclosures, of from ten to twenty acres, according to the size of the farm, in perennial pasture, for the feeding of cattle and sheep; and as a resource for the stock to go to in case of a severe spring, or summer drought; but the retaining of any considerable portion of a farm in old turf, or permanent pasture, unless of the richest quality, is, in general, injurious to the landlord, the tenant, and the public. The value of any estate, where the system of permanent pasture has been carried to an unreasonable extent, may be easily and greatly augmented by appropriating the manure of the farm to turnips and other green crops, and by the adoption of the convertible system of husbandry.

5274. *There are many cases where this doctrine, though in general to be recommended, ought not to be carried to its full extent.* In Norfolk, where the land is commonly light, and where sheep are both bred and fed upon the same farm, a proportion of permanent pasture is essential. Much injury in particular has been sustained by breaking up permanent pastures on such soils, more especially when subject to rectorial tithes. Many lands of an inferior soil, which kept two sheep on an acre, paying only vicarial tithes, and rented at ten shillings per acre, since they have been broken up, cannot pay, even without rent, the tithe of corn and the expense of cultivation. A farm in general lets best, with a fair proportion of grass land upon it, which admits of a mixed management, in consequence of which, if one object fail, another may be successful.

5275. *With respect to the disadvantages of breaking up pastures, it is alleged in The Code of Agriculture, that there is a risk of tenants breaking through their engagements (p. 473, 3d edit.), by which we suppose is to be understood their chance of their taking a few good crops from the newly-broke-up lands, and then leaving the farm.* Tenants who would do this must certainly be as wicked, as the landlords who would put it in their power would be imbecile. No other disadvantage is stated, and this may safely be left to work its own cure.

SUBJECT. 3. Of breaking up Grass Lands, and afterwards restoring them to Grass.

5276. *On the subject of breaking up and laying down grass lands, the following particulars are discussed in The Code of Agriculture, as the result of the information communicated to the Board.* Whether any previous steps are necessary before lands in grass are broken up; the proper mode of effecting that object; the course of crops; the manure necessary; the system of management during the rotation; the mode of laying down the land again to grass; that of sowing the grass-seeds; and, the subsequent management.

5277. *If the land be wet, it is advisable to drain it completely, previous to its being*

broken up; for it is not improbable that its being kept in pasture was partly on account of its wetness. Land that has been long in pasture does not require dung during the first course of crops that is taken after being broken up; but the application of calcareous manure is always, in such cases, expedient. Sometimes lime is spread on the ground before it is ploughed; at other times when it is either under summer-fallow, or a drilled crop of turnips. Marl and chalk also have been used for the same purpose with great advantage. The land thence derives additional strength and vigor; the succeeding crops are much improved; the soil is commonly so softened in its texture, that it may be ploughed with half the strength that would otherwise be necessary; and whenever it is restored to grass, the herbage is abundant.

5278. *Wherever the soil is not too shallow, nor of a friable nature, or when the turf cannot soon be rotted, if land is to be broken up from old pasture, paring and burning is the proper system to be adopted.* In this way, good tilth is speedily procured; the damage that might otherwise be sustained by the grub, the wire-worm, and other insects, is avoided, while the soil receives a stimulus which ensures an abundant crop. Where paring and burning, from any circumstance, cannot take place, the land may be trenched or double-ploughed. This is effected by means of two ploughs following each other, the first plough taking off a thin surface of about three inches, and the second going deeper in the same place, covering the surface-sod with fine mould; both furrows not exceeding the thickness of the vegetable mould or other good soil. If the land is ploughed with one furrow, the operation ought to be performed before winter, that it may receive the benefit of the succeeding frosts, by which the success of the future operations will not only be promoted, but most of the insects lodged in the soil will be destroyed. When one furrow alone is taken, the best size is four inches and a half deep by eight or nine broad. The strain on horses in ploughing ley land is mostly from the depth.

5279. *The rotation of crops to be adopted, when grass lands are broken up, must partly depend upon the soil, and partly on the manner in which it is prepared for cultivation.* As a general principle, however, it may be laid down, that unless by the course of cropping to be pursued the bad grasses and other plants indigenous in the soil are extirpated, they will, when the land is again laid down to grass, increase and prevail with more rapidity and effect than seeds chosen by the farmer; and the consequence must be, a heavy disappointment in the future crops of grass, perhaps solely, or at least principally, attributable to a previous defective management. It is necessary, therefore, to enter into details upon this subject as applicable to clay, chalk, peat, loam, and sand.

5280. *Clay.* The process of conversion in clayey soils should be commenced with paring and burning, especially where the grub is suspected. The following course may then be adopted:—1. rape, sown with sheep; 2. beans; 3. wheat; 4. beans; 5. wheat; 6. fallow; 7. wheat, sown with grass-seeds. This may seem severe cropping, but is justified by experience when old grass clay land is broken up. If the land has not been pared and burnt, the first crop ought to be either oats or dibbled beans. To do justice to the plan of restoring the land to grass, there ought to be, in all cases, according to the soil, either a naked or turnip fallow, before the sowing of grass-seeds be attempted. But on mellow loamy clay land, consisting of fine old grass pasture, where it is thought necessary or advisable to break up such land, it should be done in detached pieces, so as to suit the convenience of the occupier, and the following course should be adopted:—1. autumnal ploughing for oats in spring; 2. fallow for rape, to be eaten with sheep; 3. beans; 4. wheat, sown with clover; 5. clover; 6. clover; 7. wheat; 8. rape, to be partially eaten, and hoed in spring, and to stand for seed; and 9. wheat with grass-seeds. This is a very profitable rotation, and applicable to the best grazing land in Lincolnshire.

5281. *Chalk.* Paring and burning is considered in this case to be indispensable as a preparation for turnips, which ought, where manure can be got, to be raised two years in succession; then, barley, clover, wheat; and, after one or two additional crops of turnips, the land may be laid down with sainfoin to great advantage.

5282. *Peat.* On this soil paring and burning is essentially necessary. Under a judicious system, the greatest and quickest profit is thus secured to the farmer, with advantage to the public, and without injury to the landlord. Draining also must not be neglected. The crops to be grown on peat soils are, 1. rape or potatoes; 2. oats; 3. turnips; 4. oats or wheat; and 5. clover or grass-seeds. A liberal application of lime, where it can be obtained, is of the greatest service in enabling such soils to bring corn to its full perfection. In the fens of Thorney, the following course was recommended:—1. paring and burning for rape; 2. oats; and 3. wheat with grass-seeds; if the land was safe from water, the Lammas sort, if not, spring wheat. This short course, it is contended, preserves the land in heart; and it afterwards produces abundant crops of grass. But long courses, in such a soil, run the lands to weeds and straw, without quality in the grain.

5283. *Loam.* The courses of crops applicable to this soil are too numerous to be here inserted. If the sward be friable, the following rotation may be adopted:—1. oats; 2. turnips; 3. wheat or barley; 4. beans; 5. wheat; 6. fallow or turnips; 7. wheat or barley, and grass-seeds. If the sward be very tough and coarse, instead of taking oats, it may be pared and burnt for turnips.

5284. *Sand.* On rich and deep sandy soils, the most valuable crop that can be raised is carrots. For inferior sands, turnips, to be eaten on the ground, then to be laid down with barley and grass-seeds.

5285. *According to the improved system of laying down lands to grass, land ought to be previously made as clean and fertile as possible.* With that view, all the green crops raised ought to be consumed upon the ground; fallow or fallow crops ought not to be neglected; and the whole straw of the corn crops should be converted into manure, and applied to the soil that produced it. Above all, the mixing of calcareous matter with the soil, either previous to, or during the course of cropping, is essential. Nothing generally improves meadows or pastures more than lime or marl: they sweeten the herbage, render it more palatable to stock, and give it more nourishing properties.

5286. *When turnips are raised upon light land, sheep should be folded on them; whereas, if the land be strong or wet, the crop should be drawn, and fed in some adjoining grass-field, or in sheds. If the land be in high condition, it is customary to cart off half the turnips, and eat the other on the ground. But this is not a plan to be recommended on poor soils.*

5287. *It has been disputed whether grass-seeds should be sown with or without corn. In favor of the first practice, that of uniting the two crops, it is maintained, that where equal pains are taken, the future crop of grass will succeed equally well as if they had been sown separately, while the same tillage answers for both. On the other hand, it is observed, that as the land must, in that case, be put into the best possible order, there is a risk that the corn-crop will grow so luxuriantly, as to overpower the grass-seeds, and, at any rate, will exclude them from the benefit of the air and the dews. If the season also be wet, a corn-crop is apt to lodge, and the grass will, in a great measure, be destroyed. On soils moderately fertile, the grasses have a better chance of succeeding; but then, it is said, that the land is so much exhausted by producing the corn-crops, that it seldom proves good grass land afterwards. In answer to these objections, it has been urged, that where from the richness of the soil, there is any risk of sowing a full crop of corn, less seed is used, even as low as one-third of the usual quantity; and that a moderate crop of grain nurses the young plants of grass, and protects them from the rays of a hot sun, without producing any material injury. Where the two crops are united, barley is the preferable grain, except on peat. Barley has a tendency to loosen the texture of the ground in which it grows, which is favorable to the vegetation of grass-seeds. In the choice of barley, that sort should be preferred which runs least to straw, and which is the soonest ripe. On peat, a crop of oats is to be preferred.*

5288. *The manner of sowing the grass-seeds, also, requires to be particularly attended to. Machines have been invented for that purpose, which answer well, but they are unfortunately too expensive for the generality of farmers. It is a bad system, to mix seeds of different plants before sowing them, in order to have the fewer casts. It is better, to sow each sort separately, for the expense of going several times over the ground is nothing, compared to the benefit of having each sort equally distributed. The seeds of grasses being so light, ought never to be sown in a windy day, except by machinery, an equal delivery being a point of great consequence. Wet weather ought likewise to be avoided, as the least degree of poaching is injurious. Grass seeds ought to be well harrowed, according to the nature of the soil.*

5289. *When the corn is carried off, the young crop of grass should be but little fed during autumn, and that only in dry weather; but heavily rolled in the following spring, in order to press the soil home to the roots. It is then to be treated as permanent pasture. By attention to these particulars, the far greater proportion of the meadows and pastures in the kingdom, of an inferior, or even medium quality, may be broken up, not only with safety, but with great profit to all concerned.*

CHAP. VIII.

Of Plants cultivated on a limited Scale for various Arts and Manufactures.

5290. The plants used as food for men and animals, are by far the most generally cultivated in every country, and next, those of clothing, building, and other arts of convenience or luxury. The former are often called agricultural, and the latter commercial or manufactory plants. Of manufactory plants, only a few are at present cultivated in Britain; the national policy rendering it preferable to import them, or substitutes, from other countries. Some, however, are still grown in nearly sufficient quantities for home consumption, as the hop, mustard, rape, canary, and a considerable quantity of flax, anise, carraway; and some hemp, teazle, and woad are also raised. These and other plants may be classed as grown for the clothing, distilling, brewing, oil making, domestic, and medical arts.

SECT. I. *Of Plants grown chiefly for the Clothing Arts.*

5291. The clothing plants are flax, hemp, teazle, madder, woad, and weld; the three first are used by the manufacturer of the fabric, and the others by the dyer.

SUBSECT. 1. *The Flax.* — *Linum usitatissimum*, L. *Pentan. Pentag. L.* and *Caryophyllea*, J. *Lin*, Fr.; *Flacks*, Ger.; and *Lino*, Span. and Ital. (fig. 588 a.)

5292. The flax has been cultivated from the earliest ages, and for an unknown length of time in Britain, of which it is now considered a naturalised inhabitant. It is cultivated both for its fibre for making thread, and its seed for being crushed for oil; but never has been grown in sufficient quantity for either purpose. The legislature of the country, as Brown observes, has paid more attention to framing laws regarding the husbandry of flax than to any other branch of rural economy; but it need not excite surprise that these laws, even though accompanied by premiums, have failed to induce men to act in a manner contrary to their own interest. The fact is, the culture of flax is found on the whole less profitable, than the culture of corn. It is one of the most severe crops when allowed to ripen its seed; but by no means so when pulled green.

5293. The varieties of the common flax are few, and scarcely deserving of notice. Marshal mentions the blue or lead-colored flax as being cultivated in Yorkshire, and Professor Thier mentions a finer and coarser variety; he also, as



well as some other agriculturists, has tried the *Linum perenne* (b), but though it affords a strong fibre, it is coarse and difficult to separate from the woody matter.

5294. *The soils most proper for flax, besides the alluvial kinds, are deep and friable loams, and such as contain a large proportion of vegetable matter in their composition. Strong clays do not answer well, nor soils of a gravelly or dry sandy nature. But whatever be the kind of soil, it ought neither to be in too poor nor in too rich a condition; because, in the latter case, the flax is apt to grow too luxuriant, and to produce a coarse sort; and, in the former case, the plant, from growing weakly, affords only a small produce.* (*Tr. on Rural Affairs,*)

5295. *If there be water at a small depth below the surface of the ground, it is thought by some still better, as is the case in Zealand, which is remarkable for the fineness of its flax, and where the soil is deep and rather stiff, with water almost every where, at the depth of a foot and a half or two feet underneath it. It is said to be owing to the want of this advantage, that the other provinces of Holland do not succeed equally well in the culture of this useful plant; not but that fine flax is also raised on high lands, if they have been well tilled and manured, and if the seasons are not very dry. It is remarked, in the letters of the Dublin Agricultural Society, that moist stiff soils yield much larger quantities of flax, and far better seed, than can be obtained from light lands; and that the seed secured from the former may, with proper care, be rendered full as good as any that is imported from Riga or Zealand. M. Du Hamel, however, thinks that strong land can hardly yield such fine flax as that which grows on lighter ground.*

5296. *The place of flax in a rotation of crops is various, but in general it is considered as a corn or exhausting crop, when the seed is allowed to ripen; and as a green, or pea, or bean crop, when the plant is pulled green. Flax, Donaldson observes, is sown after all sorts of crops, but is found to succeed best on lands lately broken up from grass. In Scotland, the most skilful cultivators of flax generally prefer lands from which one crop of grain only has been taken, after having been several years in pasture. When such lands have been limed or marled, immediately before being laid down to grass, the crop of flax seldom or never misgives, unless the season prove remarkably adverse. In the north of Ireland flax is generally sown by the small farmers after potatoes. In Belgium, it is supposed not to do well after pease or beans; nor to succeed if sown oftener on the same soil than twice in nine years.* (*Von Thær.*)

5297. *The preparation of the soil, when grass land is intended for flax, consists in breaking it up as early in the season as possible, so that the soil may be duly mellowed by the winter frosts, and in good order for being reduced by the harrows, when the seed process is attempted. If flax is to succeed a corn crop, the like care is required to procure the aid of frost, without which the surface cannot be rendered fine enough for receiving the seed. Less frost, however, will do in the last, than in the first case; therefore, the grass land ought always to be earliest ploughed. At seed-time, harrow the land well before the seed is distributed, then cover the seed to a sufficient depth, by giving a close double tine of the harrows. Water-furrow the land, and remove any stones and roots that may remain on the surface, which finishes the seed process.*

5298. *The ordinary season of sowing flax seed is from the middle of March to the middle or end of April, but the last week of March and the first ten days of April is esteemed the best time; and accordingly within these periods the greatest quantity of flax-seed is sown in this country. In France and Italy it is often sown in the autumn, by which a larger crop is produced, especially when seed is desired.*

5299. *The quantity of seed depends on the intention of the crop. When a crop of seed is intended to be taken, thin sowing is preferable, in order that the plants may have room to throw out lateral shoots, and to obtain air in the blossoming and filling seasons. But it is a mistake to sow thin when flax is intended to be taken, for the crop then becomes coarse, and often unproductive. From eight to ten pecks per acre, is the proper quantity in the last case, but when seed is the object, six pecks will do very well. (*Brown.*) Thick-sown flax runs up in height, and produces fine soft flax; if sown thin, it does not rise so high, but spreads more and puts forth many side branches, which produce abundance of seed, and such seed is much better filled, plump, and heavy, than the seed produced from thick-sown flax. (*Donaldson.*)*

5300. *In the choice of seed, that which is of a bright brownish color, oily to the feel, and at the same time weighty, is considered the best. Linseed, imported from various countries, is employed. That brought from Holland is, however, in the highest estimation, as it not only ripens sooner than any other that is imported, but also produces greater crops, and flax of that quality which best suits the chief manufactures of the country. American seed produces, in common, fine flax, but neither the quantity of flax nor of the pods, provincially the "bolls," which contain the seeds, is so large as the produce from Dutch linseed. Riga seed yields a very coarse sort of flax, but a greater quantity of seeds than any other. It is common in some parts of Scotland to sow seeds saved from the crop of the preceding year, especially when that crop was raised from seed imported from Holland. The success of this practice is found to depend greatly on changing the seed from one sort of soil to another of an opposite nature; but the saving in the expense of purchasing that sort of seed, in place of what is newly imported from*

Holland, is so inconsiderable, and the risk of the crop misgiving so much greater in the one case than in the other, that those only who are ignorant of the consequences, or who are compelled from necessity, are chargeable with this act of ill-judged parsimony. Flax seed is by some farmers changed every three years, but many have sown the same seed ten years in succession without perceiving any degeneracy. When any degeneracy takes place, the seed of flax grown on a different soil, as moss, moor, sand, &c. without any view to the produce in fibre, will, it is said, answer as well as foreign seed.

5301. *The manner of sowing* is almost always the same, but when seed is the main object, drilling may be adopted, by which seed will be saved in sowing, cleaning conducted at less expense, and the plants rendered more vigorous and branchy by the stirring of the soil, and the admission of air between the rows. The fibres of flax grown in this way, however, will be shorter and less equal in thickness throughout their length, than flax grown by the broad-cast mode, and tolerably thick.

5302. *The after-culture of flax* consists chiefly in weeding, but sometimes it commences with rolling the surface, which is a very proper operation when the soil is very dry, the season advanced, or the earth very porous. By this process the earth is pressed firmly to the seeds, and they are thereby stimulated to vegetate sooner, and the drought is kept out. On some soils, and in wet or stormy seasons, flax is apt to be laid, to guard against which some cultivators run across their flax field slender poles fixed to stakes; but a better method is to run small ropes across the field, both lengthwise and breadthwise, where necessary, for these being fastened where they intersect one another, and supported by stakes at due distances, form a kind of net-work, which is proof against almost every accident that can happen from tempestuous weather.

5303. *In Scotland* a crop of flax is sometimes weeded by turning a flock of sheep at large into the field. They will not taste the young flax plants, but they carefully search for the weeds, which they devour.

5304. *The flax crop is taken by pulling*, on which there is a considerable difference of opinion. None, however, think of pulling it before it comes into flower, when fibre is the sole object; or before the seed in the capsules acquires a brownish color, when fibre and seed jointly, or seed alone, is the object. Some argue for pulling while it is green, in order that its fibres may be softer and finer: others, with the same view, pull it up before its seeds are quite formed; and others again think that it should not be pulled till some of the capsules which contain the seeds have begun to open, being of opinion that the fibres of green flax are too tender, and that they fall into tow. On the other hand, it is certain the fibres of flax which has stood till it is very ripe, are always stiff and harsh, that they are not easily separated from the reed, and that they do not bleach well. Here, therefore, as in most other cases, both extremes should be avoided, and it consequently seems most reasonable to think that the properest time for pulling flax, is when its stalks begin to turn from a green to a yellow, when its leaves begin to fall, and when its seeds begin to be brown. Donaldson observes, that a crop of flax frequently grows short, and runs out a great number of seed-bearing branches. When that is the case, the seeds, not the flax, ought to be the farmer's chief object, and the crop should be allowed to stand till the seeds are in a great measure perfected. But that when the crop thrives, and is likely to become more valuable for the flax than the seeds, it should be pulled soon after the bloom drops off, and before the pods turn hard and sharp in the points. When flax is grown for its fibre, Brown considers it the safest course to take it a little early, any thing wanting in quantity, being, in this way, made up by the superiority of quality.

5305. *The operation of pulling flax* differs according to the intention of the crop. When it is grown for the fibre it is pulled and tied immediately into sheaves like corn, being carried off immediately to be watered. But when the seed is to be taken from the plant, it is pulled and laid in handfuls.

5306. *In pulling flax*, it is usual, when it is intended to save the seeds, to lay it in handfuls, partly across each other; the reason for which is, that the business of ripping is thereby facilitated, as the rippers, in place of having to separate each handful from the bundle, find it by this simple precaution already done to their hand. Although it is of much importance, yet it very seldom happens, that much attention is bestowed to separate the different sorts of flax from each other, in pulling the crop. In most fields, there are varieties of soils; of course some parts of a field will produce fine flax; others coarse; some long; and some short: in a word, crops of different lengths and qualities. It cannot be supposed that all these sorts of flax will undergo an equal degree of watering, grassing, breaking, and heckling, without sustaining great injury.

5307. *As the flax is pulled*, it is laid together by handfuls, with the seed end turned to the south. These handfuls should neither lie quite in a line with each other, nor directly across, but a little slanting upwards, so that the air may easily pass through them. Some, instead of this method, tie the handfuls of flax loosely at the top, then spread out their roots, and thus set several of them together upright upon their roots. In either of these ways, the flax is generally left twelve or fourteen days in the field to dry it. This drying is certainly not necessary for the ripping, because the ripple will separate the capsules from the flax as effectually before it has been dried as it will afterwards; and if it be done with a view to ripen the seed, it should be considered, that the flax will be more hurt by the longer time of steeping, which will become necessary in consequence of this drying, than the seed can be benefited; because, the more the membrane which connects the fibres to the reed is dried, the greater must be the degree of putrefaction necessary to loosen and destroy the cohesion of this connecting membrane; the

flax parts of the flax itself must necessarily be destroyed by this degree of putrefaction; and if the putrefaction does not arise to such a degree as to destroy the cohesion of this membrane, the fibres of the flax will adhere so strongly to the reed, that the force necessary in scutching will prove equally detrimental to the flax. The practice adopted in some parts of Britany seems therefore much more rational, which is, to ripple the flax after it has lain in the air two or three days; but even one day will be sufficient, if the weather is dry.

5908. *In the process of rippling*, which is the next operation, a large cloth should be spread on a convenient spot of ground, with the ripple placed in the middle of it. In performing this business, the pods containing the seeds are forced from the stalks by means of the iron comb called a ripple, fixed on a beam of wood, on the ends of which two persons sit, who, by pulling the seed end of the flax repeatedly through this comb, execute the operation in a very complete manner. It is remarked by the author of *The Present State of Husbandry in Great Britain*, that "those who bestow much attention on the cultivation of flax in Scotland generally ripple off the seed, even when there is no intention of saving it; as it is found, when flax is put into water without taking off the pods, the water soon becomes putrid, in consequence of which the flax is greatly injured."

5909. *The management of the capsules and separation of the seed*, is the next operation. The capsules obtained should be spread in the sun to dry, and those which separate from the pods of their own accord being the fullest and ripest, should be set apart for sowing, in case the precaution of raising some flax purposely for seed has not been attended to. The capsules are then broken, either by treading or by threshing, in order to get out the remaining seeds, the whole of which, as well as the former, should be carefully sifted, winnowed, and cleaned. When the seed is laid up, it must be frequently stirred, or ventilated, to prevent its heating. Even this second seed affords a considerable profit, by the oil which it yields, and also by being used when broken for fattening of cattle.

5910. *To facilitate the separation of the fibre from the bark*, it is necessary to accelerate the process of decay or putrefaction. This may be done in different ways, but the chief are those of bleaching alone, or of steeping and bleaching. Bleaching is a tedious and laborious operation when it is intended as a substitute for steeping, but it is the most certain for not injuring the fibre, and may be adopted on a small scale when steeping places are not at hand. In Dorsetshire, and some other places, flax, instead of being steeped, is what is called dew-retted; that is, the stalks are allowed to arrive at that state in which the harl or woody parts, separate most easily from the boon, reed or fibre, by a more gradual process, that of ripening by the action and influence of the dew. This is nothing more than exposing the flax to the influence of the weather for a longer period than is necessary, when the operation of watering has been previously performed. Steeping, however, is the most universal practice both in Britain and on the continent. Of late, an invention has been made by Lee of Middlesex, by which with the aid of soft soap and machinery, the fibre is more completely separated than by steeping, and uninjured by that process. When flax is to be separated by this new process, the cultivator has only to pull it in handfuls, dry it, bind it into sheaves or faggots, and put it up in stacks like corn, till wanted by the manufacturer.

5911. *Steeping or watering*, is and will be the general practice till flax dressing machines come into universal use. In performing this operation, the flax, whether it has been dried and rippled, or pulled green, is loosely tied into small bundles, the smaller the better, because it is then most equally watered. These sheaves ought to be built in the pool in a reclining upright posture, so that the weight placed above may keep the whole firm down. The weights made use of are commonly stones placed on planks, or directly on the flax.

5912. *The Flemish mode of steeping flax*, as described by Radcliff, is said to improve the quality of the flax; and greatly increase its whiteness. This mode differs from the common practice, in placing the bundles in the steep vertically, instead of horizontally; in immersing the flax by means of transverse sticks, with that degree of weight annexed which shall not push it down to the bottom, but leave it the power to descend spontaneously towards the conclusion of the steepage; and in leaving at first a space of at least half a foot between the bottom and the roots of the flax. The spontaneous descent of the flax is an indication of its being sufficiently steeped; and the strength and quality of the fibre are said to be much better preserved by this mode, in which the temperature of the atmosphere acts with most force on the upper part of the plant, which needs it most.

5913. *The water most proper for steeping flax* should be clear, soft, and in standing pools. Compared with running water, pools occasion the flax to have a better color, to be sooner ready for the grass, and even to be of superior quality in every respect. When soft clear stagnating water cannot be obtained without art, a pit or canal is commonly formed, adjoining to a river or stream, whence water can be easily brought. This pit or canal is filled with water for some time (a week or two) before it be proposed to pull the flax; by this means the water acquires a greater degree of warmth than river-water possesses, and which contributes greatly to facilitate the object farmers have in view in

immersing green flax in water, namely, to make the harl or flaxy substance part easily and completely from the boon or reed.

5314. *The period that flax ought to remain in the water*, depends on various circumstances; as the state of ripeness in which it was pulled, the quality and temperature of the water, &c. The most certain rule by which to judge when flax is sufficiently watered, is, when the boon becomes brittle, and the harl separates easily from it. In warm weather, ten days of the watering process is sufficient; but it is proper to examine the pools regularly after the seventh day, lest the flax should putrefy or rot, which sometimes happens in very warm weather. Twelve days will answer in any sort of weather; though it may be remarked, that it is better to give too little of the water, than too much, as any deficiency may be easily made up by suffering it to lie longer on the grass, whereas an excess of water admits of no remedy. (Brown.)

5315. *Grassing or bleaching flax* is the next operation, the intention of which is to rectify any defect in the watering process, and carry on the putrefactive process to that point when the fibre will separate from the bark, boon, reed or harl, (as the woody part of the stem is called) with the greatest ease. In performing this operation, the flax is spread very thin on the ground, and in regular rows; the one being made to overlap the other a few inches, with a view of preventing, as much as possible, its being torn up and scattered by gales of wind. Old grass-ground, where the herbage does not grow to any great height, is the best for the purpose; as when the grass or weeds spring up so as to cover the flax, it is frequently routed, or at least greatly injured thereby.

5316. *The time allowed for grassing* is regulated by the state of the flax, and seldom exceeds ten or twelve days. During this time it is repeatedly examined, and when it is found that the boon has become very brittle, so that, on being broken, and rubbed between the hands, it easily and freely parts from the harl, it is then taken up, a dry day being chosen for the purpose, and, being bound in sheaves, is either sent directly to the mill, which is the usual practice in the northern districts, or broken and scutched, by a machine or implement for the purpose.

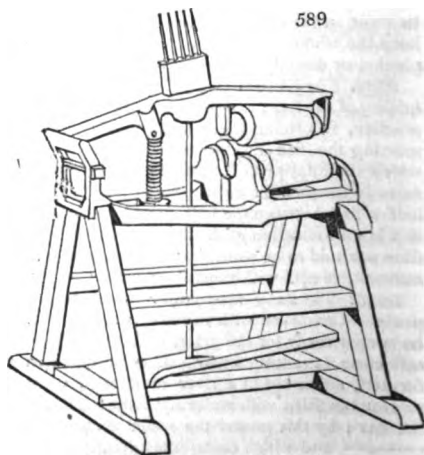
5317. *Steeping flax in hot water and soft soap* 'said to be the invention of Lee, and for which he was granted by parliament a secret or unenrolled patent' is said to separate the fibre from the woody matter better than steeping in water; and this in the short space of two or three hours, and either with green flax, or such as has been dried and stacked for months or years.

5318. *The dressing of flax* consists of various operations, such as scutching, tracking, or breaking, by which the woody part is broken; and heckling or combing, by which the fibre is separated from the woody part, and sorted into lengths. These operations are often all performed by the cottager, or small farmer, who grows flax for the purpose of spinning the fibre in his own family. But there are also public flax mills, impelled by water or other powers, by which flax is scutched, and it is then heckled by professed hecklers.

5319. *A method of preparing flax in such a manner as to resemble cotton in whiteness and softness*, as well as in coherence, is given in *The Swedish Transactions* for the year 1747. For this purpose a little sea-water is to be put into an iron pot or an untinned copper-kettle, and a mixture of equal parts of birch-ashes and quick-lime strewed upon it; a small bundle of flax is to be opened and spread upon the surface, and covered with more of the mixture, and the stratification continued till the vessel is sufficiently filled. The whole is then to be boiled with sea-water for ten hours, fresh quantities of water being occasionally supplied in proportion to the evaporation, that the matter may never become dry. The boiled flax is to be immediately washed in the sea by a little at a time, in a basket, with a smooth stick at first, while hot; and when grown cold enough to be borne by the hands, it must be well rubbed, washed with soap, laid to bleach, and turned and watered every day. Repetitions of the washing with soap expedite the bleaching; after which the flax is to be beat, and again well washed; when dry, it is to be worked and carded in the same manner as common cotton, and pressed betwixt two boards for forty-eight hours. It is now fully prepared and fit for use. It loses in this process near one-half its weight, which, however, is abundantly compensated by the improvement made in its quality.

5320. *Lee's method of breaking flax and hemp, without dew-retting*, was invented in 1810, and was the first step towards a great improvement, brought nearer perfection by the new patent machines of Messrs. Hill and Bundy.

5321. *Hill and Bundy's machines* (fig. 589.) are portable, and may be worked in barns or any kind of out-house; they are also well-calculated for parish work-houses and charitable institutions; a great part of the work being so light that it may be done by children and infirm persons; and such is the construction and simplicity of the machines, that no previous instruction or practice is required; their introduction, therefore, into those asylums, would be the means of effecting a considerable reduction of the poor's rate. The woody part is removed by a very simple machine; and, by passing through a second



machine equally simple, the flax may be brought to any degree of fineness, equal to the best used in France and the Netherlands, for the finest lace and cambric. The original length of the fibre, as well as its strength, remains unimpaired; and the difference of the produce is immense, being nearly two-thirds; one ton of flax being produced from four tons of stem. The expense of working each ton obtained by this method is only five pounds. The glutinous matter may be removed by soap and water only, which will bring the flax to such perfect whiteness, that no further bleaching is necessary, even after the linen is woven; and the whole process of preparing flax may be completed in six days.

5322. *The produce of flax in seed* is generally from six to eight, sometimes as high as ten or twelve, bushels per acre; and the price depends, in a great measure, on that of foreign seed imported; as, when sold to oil-makers, it is generally about one half of that of Dutch seed sold for the purpose of sowing. The price of home-cultivated linseed is considerably advanced of late in some of the southern and western counties of the kingdom, in proportion to what it is in those of the northern, owing to the circumstance of its being much used as food for fattening cattle. The average price of the linseed cultivated in the kingdom at large, cannot, it is supposed, be rated higher than from three to four shillings the bushel. The seed is separated into three qualities; the best for sowing; the second best for crushing for oil; and the inferior for boiling or steaming for cattle.

5323. *The produce of flax in fibre* varies exceedingly. Before being sorted, the gross product of fibre varies from three cwt. to half a ton per acre.

5324. *The use of flax* in the linen manufacture is well known. The seed is crushed for oil, which is that in common use by painters; the cake or husk which remains, after the expression of the oil, is sold for fattening cattle, and in some places as a manure; and the inferior seed not fit to crush, is boiled and made into flax-seed jelly, esteemed an excellent nutriment for stock.

5325. As the *making of flax-seed jelly* is an agricultural operation, we shall here describe it. The proportion of water to seed is about seven to one. Having been steeped in part of the water eight-and-forty hours, previous to the boiling, the remainder is added cold, and the whole boiled gently about two hours, keeping it in motion during the operation to prevent its burning to the boiler; thus reducing the whole to a jelly-like, or rather a gluey or ropy consistence. After being cooled in tubs, it is given, with a mixture of barley-meal, bran, and cut chaff; a bullock being allowed about two quarts of the jelly per day, or somewhat more than one quart of seed in four days: that is, about one-sixteenth of the medium allowance of oil-cake.

5326. *The diseases of flax* are few, and chiefly the fly, which sometimes attacks the plants when young, and the mildew and rust.

SUBJECT. 2. *Hemp*. — *Cannabis sativa*, L. *Diæcia Pentandria*, L. and *Urticæ*, J. Chanvre, Fr.; Hanf, Ger.; Canomo, Span.; and Canapa, Ital.

5327. *The hemp* is a plant of equal antiquity with the flax. It is supposed to be a native of India, or of some other Asiatic country, being too tender to be even naturalized in Europe. It is one of the few plants employed in British agriculture, in which the male and female flowers are in different plants, a circumstance which has some influence on its culture and management. It grows to a great height on good soils, sometimes to six or seven feet in this country, but in Italy generally higher; and Crud states that he has seen it fifteen feet eight inches high in the Bolognese territory, and a friend of his eighteen feet six inches: in both cases the fibre being of remarkable beauty. This luxuriance of the hemp in warm countries may be one reason why it has never been much cultivated in England. In the isle of Axholme, in Lincolnshire, it has been cultivated from time immemorial, and also for some centuries in Suffolk, but chiefly for local manufacture. The culture, management, and uses of hemp, are nearly the same as of flax. When grown for seed it is a very exhausting crop; but when pulled green, it is considered a cleaner of the ground, and is said to have the property of preserving from insects any crop which it may surround. The objections to this crop are, that its coming in the midst of harvest is embarrassing; and that the attention it demands in every state of its progress is too great, where it is only a secondary consideration.

5328. *The soils* most suitable for hemp are those of the deep black putrid vegetable kind, which have a situation low, and somewhat inclined to moisture, as well as the deep mellow loamy or sandy sorts. But the quantity of produce is in general much greater on the former than the latter; though, according to some, of an inferior quality. Mellow rich clayey loams do well; and nothing better than old meadow land.

5329. *The preparation of the soil*, and place in the rotation, are the same as for flax.

5330. *The season of sowing* is towards the end of April, when there is no longer any danger of frost injuring the rising plants. The quantity of seed is from two to three bushels, according to the quality of the land. In quality the seed must be fresh, heavy, and bright in color. Broad-cast is the universal mode of sowing, and the only after-culture consists in keeping off birds when it is coming up; in weeding, and sometimes in supporting the crop by cross rods or lines, as in the case of flax. (5302.)

5331. In *taking the hemp crop*, two methods are in use according to the object in view. When the crop is grown entirely for the fibre, it is pulled when in flower, and

no distinction made between the male and female plants. But as it is most commonly grown, both with a view to fibre and seed, the usual practice is to pull the male plants as soon as the setting of the seed in the females shews that they have effected their purpose. As the female plants require four or five weeks to ripen their seeds, the males are thus pulled so long before them.

5332. In the operation of pulling the males, the pullers walk in the furrows, between the ridges, and reach across to the crown of the ridge, pulling one or two stalks at a time, and carefully avoiding to tread down the female plants. The male stalks are easily known by their yellowish hue, and faded flowers. They are tied in small bundles, and immediately carried to the watering pool, in the manner of flax.

5333. The operation of pulling the females commences when the seed is ripe, which is known by the brownish or greyish hue of the capsules and fading of the leaves. The stalks are then pulled and bound up into bundles, being set up in the same manner as grain, until the seed becomes so dry and firm as to shed freely; great care should be taken at pulling not to shake the stalks rashly, otherwise much of the seed may be lost. It is advised, that, after pulling the seed, hemp may be set to stand in shocks of five sheaves to dry the seed; but, in order to prevent any delay in watering, the seed-pods may be cut off with a chopping-knife, and dried on canvass exposed to the air, under some shed or cover. This last method of drying the seed will prove of great advantage to the hemp, as the seed and pods, when green, are of such a gummy nature, that the stems might suffer much by sun-burning or rain; which will discolor and injure the hemp before the seed can be sufficiently dried upon the stalks. Besides, the threshing-out the seed would damage the hemp in a considerable degree.

5334. Hemp is watered (provin. water-retted), bleached (provin. dew-retted), and grassed in the same manner as flax. Grassing is omitted in some places, and drying substituted; and in other districts watering is omitted with the female crop, which is dried and stacked, and dewed or bleached the following spring. On the continent hot-water and green soap has been tried, and here, as in the case of flax, it is found that steeping two hours in this mixture, is as effectual in separating the fibre from the woody matter, as watering and grassing for weeks.

5335. Although hemp in the process of manufacturing, passes through the hands of the breaker, heckler, spinner, whistler, weaver, and bleacher; yet many of these operations are frequently carried on by the same person. Some weavers bleach their own yarn and cloth, others their cloth only; some heckle their tow, and put it out to spinning, others buy the tow, and put it out; and some carry on the whole of the trade themselves.

5336. The produce of hemp in fibre, varies from 3 to 6 cwt. per acre; in seed from 11 to 12 bushels.

5337. The uses of hemp are well known, as well as its great importance to the navy for sails and cordage. Exceeding good huckaback is made from it, for towels and common table-cloths. The low-priced hempen cloths are a general wear for husbandmen, servants, and laboring manufacturers; the better sorts for working farmers and tradesmen in the country; and the finer ones, seven-eighths wide, are preferred by some gentlemen, for strength and warmth. They possess this advantage over Irish and other linens, that their color improves in wearing; whilst theirs declines. English hemp, properly manufactured, stands unrivalled in its strength, and is superior in this respect to the Russian. Considerable quantities of cloth are imported from that country for sheeting merely on account of its strength, for it is coarser at the price than other linen. Our hempen cloth, however, is preferable, being stronger from the superior quality of the thread, and at the same time lighter in washing. The hemp raised in England is not of so dry and spongy a nature as what we have from Russia and India, and therefore it requires a smaller proportion of tar to manufacture it into cordage. Tar being cheaper than hemp, the rope-makers prefer foreign hemp to ours, because they can make a greater profit in working it: but cordage must certainly be stronger in proportion, as there is more hemp and less tar in it, provided there be a sufficient quantity of the latter to unite the fibres. An oil is extracted from the seeds of hemp, which is used in cookery in Russia, and in this country by painters. The seeds themselves are reckoned a good food for poultry, and are supposed to occasion hens to lay a greater quantity of eggs. Small birds in general are very fond of them, but they should be given to caged birds with caution, and mixed with other seeds. A very singular effect is recorded, on very good authority, to have been sometimes produced by feeding bullfinches, and goldfinches, on hemp-seed alone, or in too great quantity; viz. that of changing the red and yellow on those birds to a total blackness.

5338. The hemp has few or no diseases.

SUBSECT. 3. The Fuller's Thistle, or Teazle.—*Dipsacus fullonum*, L. *Tetraz. Mon. L.* and *Dipsacæ*, J. Chardon à foulon, Fr.; *Kardendistel*, Ger.; *Cardencha*, Span.; and *Dissaco*, Ital. (fig. 590.)

5339. The fuller's thistle is a herbaceous biennial, growing from four to six feet high; prickly or rough in the stem and leaves, and terminated by rough burr-like heads of flowers. It is a native of Britain, flowers in July, and ripens its seed in September. It is cultivated in Essex, and the west of England, for raising the nap upon woollen cloths, by means of the crooked awns or chaffs upon the heads; which in the wild sort are said to be less hooked. For this purpose they are fixed round the circumference of a cylinder, which is made to turn round, and the cloth is held against them.

5340. There are no varieties of the cultivated teasle, but the wild species is not materially different from it, and may be used in its stead, though its chaff is not quite so rigid.

590



5341. *The soils on which the teasle grows strongest, are deep, loamy clays, not over rich. The situation should be rather elevated, airy and exposed to the south. In a rotation it may occupy the place of a green and corn crop, as the first year the plants are treated like turnips, and the second the crop is ripened. The soil should be ploughed deep, and well comminuted by cross ploughings, or stirrings with pronged implements, as the cultivator.*

5342. *The sowing season is the beginning of April: the quantity of seed is from one to two pecks per acre, and in quality it should be fresh and plump. The mode of sowing is almost always broad-cast, but no crop is better adapted for being grown in drills, as the plants require hoeing and thinning. The drills may be either sown on ridgelets or a flat surface, in the manner of turnips, or by ribbing. The distance between the rows may be from eighteen inches to two feet. In Essex, carraway is commonly sown with the teasle crop; but this is reckoned a bad plan.*

5343. *The after-culture of this crop consists the first year in hoeing and stirring the soil, and in thinning out the plants to the distance of one foot every way, if sown broad-cast, or to the distance of six inches if sown in rows. Vacancies may be filled up by transplanting; and a separate plantation may be made with the thinnings, but these never attain the same vigor as the seedlings. The culture the second year consists also of hoeing, stirring, and weeding, till the plants begin to shoot. When the teasle is grown broad-cast, the intervals between the plants are dug by means of spades which have long narrow blades, not more than about four inches in breadth, having the length of sixteen or eighteen inches. With these the land is usually worked over in the intervals of the plants three or four times during the summer months; and in the course of the following winter, as about the latter end of February, the land between the plants is to be again worked over by the narrow spades, care being taken that none of the mould falls into the hearts of the plants. And again about the middle of May, when they begin to spindle, another digging over is given, the earth being raised round the root-stems of the plants, in order to support and prevent them from being blown down by the wind. Some cultivators perform more frequent diggings, that the ground may be rendered cleaner and more mellow; consequently the growth of the plants will be the more effectually promoted. This business, in Essex, has usually the name of spaddling, and is executed with great despatch by laborers that are accustomed to perform it.*

5344. *The taking of the teasle crop, when no regard is had for seed, commences about the middle of July, when the blossoms begin to fall from the top, or terminating heads of flowers. It is the best method to have the heads cut as they become ripe; but the work is mostly executed at three different times, at the distances of about ten days or a fortnight from each other. It is performed by means of a knife, contrived for the purpose, with a short blade and a string attached to the haft. This last is done in order that it may be hung over the hand. A pair of strong gloves is likewise necessary. Thus prepared, the laborer cuts off the ripe heads along the rows or lines with about nine inches of stem, and ties them up in handfuls with the stem of one that is more perfectly ripened. And on the evening of the day on which they are cut, they should be put into a dry shed; and when the weather is fine and the air clear, they should be taken out and exposed to the sun daily till they become perfectly dry. Much care must, however, be taken that no rain falls upon them. In doing this, some make use of long small stakes or poles, on which these handfuls are hung during the time of their preparation.*

5345. *As soon as they are completely dried, they should be laid up in a dry room, in a close manner, till they are become tough and of a bright color, and ready for use. They should then be sorted or separated into three different kinds, by opening each of the small bundles. These are distinguished into kings, middlings, and scrubs, according to their different qualities. They are afterwards, the author of *The Somerset Report* says, made into packs, which, of the first sort, contain nine thousand heads, but when of the second twenty thousand; the third is a sort of very inferior value. By some, before forming them into packs, they are done up into what are termed staves, by means of split sticks, when they are ready for sale.*

5346. *The produce of teasle varies from ten to fifteen packs on the acre; nine packs of kings, nineteen of middlings, and two of scrubs, are reckoned a large crop, with a great bulk of haulm. Often, however, the crop fails.*

5347. *The use of the heads of the teasle has been already mentioned. The haulm is of no use but for burning as manure. Parkinson observes, that this is a sort of crop that may be grown to advantage on many lands; in a rotation as a fallow to prepare for wheat, and by burning the straw and refuse stuff after the crop is reaped, it will be found not to impoverish, but rather improve the land. In their young state, the teasle plants stand the winter without danger; and are a good crop for clearing land of all weeds, from their lateness in the process of hoeing, there being few weeds that vegetate at so advanced a season: on all these accounts they become an advantageous crop for the farmer.*

5348. *To save seed, leave a few of the very best plants uncropped, and then when the seed is ripe cut off only the largest and terminating heads, from which the seed is easily separated by beating with flails, and cleaned by the winnowing machine, or a sieve.*

5349. *The chief injuries to which the teazle is liable are those effected by the fly and slug in its infant state.*

SUBSECT. 4. *Madder.* — *Rubia tinctorum*, L. *Tetran.* Monog. L. and *Rubiaceæ*, J. *Garance*, Fr.; *Färberrüthe*, Ger.; *Rubia*, Span.; and *Robia*, Ital. (Ag. 591.)

5350. *The dyer's madder* has a perennial root, and an annual stalk. The root is composed of many long, thick, succulent fibres, almost as large as a man's little finger; these are joined at the top in a head, like the roots of asparagus, and strike very deep into the ground, being sometimes more than three feet in length. From the upper part (or head of the root) come out many side roots, which extend just under the surface of the ground to a great distance, whereby it propagates very fast; for these send up a great number of shoots, which, if carefully taken off in the spring soon after they are above ground, become so many plants. It is a native of the south of Europe, flowers in June, and seeds soon afterwards; but by them it is never propagated. Madder is mentioned by the Greeks as a medical plant, but when it was first used in dyeing is uncertain. It has been cultivated in Holland and Flanders, and other parts of the continent for that purpose for many centuries, and has been tried in this country, but unless the importation of the root from the continent were entirely prevented, it will not answer. Its culture has been attempted at different times when our commerce with the Dutch was interrupted, or when they raised the price of the article exorbitantly high. At present it may be imported not only from Holland, but from France, Italy, and Turkey.



5351. *The soils* most suited to the cultivation of madder, are those of the deep fertile sandy loams that are not retentive of moisture, and which have a considerable portion of vegetable matter in their composition. It may also be grown on the more light descriptions of soil that have sufficient depth, and which are in a proper state of fertility.

5352. *The preparation of the soil* may either consist in trench-ploughings, lengthways and across, with pronged stirrings, so as to bring it to a fine tilth; or, what will often be found preferable, by one trenching two feet deep by manual labor.

5353. *The sets or plants* are best obtained from the runners, or surface-roots of the old plants. These being taken up, are to be cut into lengths of from six to twelve inches, according to the scarcity or abundance of runners. Sets of one inch will grow if they have an eye or bud, and some fibres, but their progress will be injuriously slow for want of maternal nourishment. Sets may also be procured by sowing the seeds in fine light earth a year before they are wanted, and then transplanting them; or sets of an inch may be planted one year in a garden, and then removed to the field plantation.

5354. *The season of planting* is commonly May or June, and the manner is generally in rows nine or ten inches asunder, and five or six inches apart in the rows. Some plant promiscuously in beds with intervals between, out of which earth is thrown in the lazy-bed manner of growing potatoes; but this is unnecessary, as it is not the surface, but the descending roots which are used by the dyer.

5355. *The operation of planting* is generally done by the dibber, but some ley-plant them by the aid of the plough. By this mode the ground is ploughed over with a shallow furrow, and in the course of the operation the sets are deposited in each furrow, leaning on and pressed against the furrow-slice. This, however, is a bad mode, as there is no opportunity of firming the plants at the roots, and as some of the sets are apt to be buried, and others not sufficiently covered.

5356. *The after-culture* consists in hoeing and weeding with stirring by pronged hoes, either of the horse or hand kind. Some earth up, but this is unnecessary, and even injurious, as tearing the surface-roots.

5357. *The madder-crop* is taken at the end of the third autumn after planting, and generally in the month of October. By far the best mode is that of trenching over the ground, which not only clears it effectually, but fits it at once for another crop. But where madder has been grown on land prepared by the plough, that implement may be used in removing it. Previously to trenching, the haulm may be removed with an old scythe, and carted to the farmery to be used as litter to spread in the straw-yards.

5358. *Drying the roots* is the next process, which, in very fine seasons, may sometimes be effected on the soil, by simply laying the plants on it as they are taken up; but in most seasons they require to be dried on a kiln, like that used for malt or hops. They are dried till they become brittle, and then packed up in bags for sale to the dyer.

5359. *The produce from the root of this plant is different according to the difference of the soil, but mostly from ten to fifteen or twenty hundred weight where they are suitable to its cultivation.*

5360. *In judging of the quality of madder-roots, the best is that which, on being broken in two, has a brightish red or purplish appearance, without any yellow cast being exhibited.*

5361. *The use of madder-roots is chiefly in dyeing and calico-printing. The haulm which accumulates on the surface of the field, in the course of three years, may be carted to the farm-yard, and fermented along with horse-dung. It has the singular property of dyeing the horns of the animals who eat it of a red color.*

5362. *Madder-seed in abundance may be collected from the plants in the September of the second and third years; but it is never so propagated.*

5363. *Madder is sometimes blighted; but in general it has few diseases.*

SUBJECT. 5. *Woad. — Isatis tinctoria, L. Tetrad. Siliq. L. and Cruciferae, J. Pastel, Fr.; Waid, Ger.; Gualda, Span.; and Guade, Ital. (fig. 592.)*

5364. *The common woad is a biennial plant with a fusiform fibrous root, and smooth branchy stem rising from three to five feet in height. It is a native, or naturalised in England, flowers from May to July, and its seeds are ripe from July to September. It has been cultivated in France for an unknown length of time, and was introduced to England in 1582, and grown with success. It is now chiefly cultivated in Lincolnshire, where it is a common practice to take rich flat tracts near rivers, at a high price, for the purpose of growing it for two or four years. Those who engage in this sort of culture, form a sort of colony, and move from place to place as they complete their engagements. It is sometimes, however, grown by stationary farmers. The leaves are the parts of the plant used, and it is considered as a severe crop.*

5365. *There is a variety of woad called the dalmatian, described by Miller, and also a wild sort, but only the common is cultivated in this country.*

5366. *The soil for woad should be deep and perfectly fresh, such as those of the rich, mellow, loamy, and deep vegetable kind. Where this culture is carried to a considerable degree of perfection, as in Lincolnshire, the deep, rich, putrid, alluvial soils on the flat tracts extending upon the borders of the large rivers, are chiefly employed for the growth of this sort of crop; and it has been shown by repeated trials that it answers most perfectly when they are broken up for it immediately from a state of sward.*

5367. *The preparation of the soil, when woad is to be grown on grass land, may either be effected by deep ploughings, with the aid of the winter's frost; cross ploughing and harrowing in spring; by deep ploughing and harrowing in spring; by paring and burning; or by trench ploughing, or spade trenching. The first mode appears the worst, as it is next to impossible to reduce old turf in one year, and, even if this is done, the danger from the grub and wire-worm, is a sufficient argument against it. By ploughing deep in February, and soon afterwards sowing, the plants may germinate before the grub is able to rise to the surface; by trench ploughing, the same purpose will be more effectually obtained; and, best of all, by spade trenching. But a method which is equally effectual with the first, more expeditious, and which has a superiority over it in more completely destroying grubs, insects, and other vermin, which are apt to feed on the plants in their early growth, is that of paring and burning. This is, however, chiefly practised where the sward is rough and abounds with rushes, sedge, and other plants of the coarse kind, but might be had recourse to on others, with benefit.*

5368. *The time of sowing may be extended from February to July. Early sowing, however, is to be preferred, as in that case the plants come up stronger and afford more produce the first season.*

5369. *The mode of sowing is generally broad-cast, but the plant might be most advantageously grown in rows and cultivated with the horse-hoe. The rows may be nine inches or a foot apart, and the seed deposited two inches in depth. The quantity of seed for the broad-cast method is five or six pounds to the acre; for the drill mode, two pounds are more than sufficient, the seed being smaller than that of the turnip. New seed, where it can be procured, should always be sown in preference to such as has been kept for some time; but when of the latter kind, it should be steeped for some time before it is put into the ground.*



5370. *The after-culture of the woad consists in hoeing, thinning, prong-stirring, and weeding, which operations may be practised by hand or horse tools, as in the culture of tealze.*

5371. *In respect to the business of gathering the crops with the spring-sown ones, the leaves will generally be ready to be gathered towards the latter end of June or beginning of July, according to the nature of the soil, season, and climate; but for those put in at a later period in the summer, they are often fit to be gathered earlier. This business should, however, constantly be executed as soon as the leaves are fully grown, while they retain their perfect green color and are highly succulent, as when they are let remain till they begin to turn pale, much of their goodness is said to be expended, and they become less in quantity, and of an inferior quality for the purposes of the dyer. In the execution of this sort of business, a number of baskets are usually provided in proportion to the extent of the crop, into which the leaves are thrown as they are taken from the plants, which is effected by the hand, by grasping them firmly and giving them a sort of a sudden twist. In favorable seasons, where the soils are rich, the plants will often rise to the height of eight or ten inches; but in other circumstances they seldom attain more than four or five: and where the lands are well managed in the culture of the plants, they will often afford two or three gatherings, but the best cultivators seldom take more than two, which are sometimes mixed together in the manufacturing of them. It is necessary, that the after croppings, when they are taken, are constantly kept separate from the others, as they would injure the whole if blended together, and considerably diminish the value of the produce. It is said that the best method, where a third cropping is either wholly or partially made, is to keep it separate, forming it into an inferior kind of woad.*

5372. *The produce is mostly from about a ton to a ton and a half of green leaves. The price varies considerably; but for woad of the prime quality, it is often from twenty-five to thirty pounds the ton, and for that of an inferior quality six or seven, and sometimes much more.*

5373. *To prepare it for the dyer, it is bruised by machinery to press the watery part; it is afterwards formed into balls and fermented, re-ground, and fermented in vats, where it is evaporated into cakes in the manner of indigo. The haulm is burned for manure or spread over the straw-yard, to be fermented along with straw-dung.*

5374. *The use of woad in dyeing, is as a basis for the black and other colors.*

5375. *To save seed, leave some of the plants undenuded of their leaves the second year, and when it is ripe in July or August, treat it like turnip-seed.*

5376. *The only diseases to which the woad is liable, are the mildew and rust; when young it is often attacked by the fly, and obliged to be re-sown, and this even on winter-ploughed grass lands more than once.*

SUBSECT. 6. *Weld or Dyer's Weed. — Reseda luteola, L. Dodæc. Trig. L. and Cappari-deæ; J. Gaude, Fr.; Waud, Ger. (fig. 593.)*

5377. *Weld is an imperfect biennial, with small fusiform roots, and a leafy stem from one to three feet in height. It is a native of Britain, flowers in June and July, and ripens its seeds in August and September. It is cultivated in a few places in England, and chiefly in Essex, for its spike of flowers and sometimes also for its leaves, both of which are used in dyeing. Its culture may be considered the same as that of woad, only being a smaller plant it is not thinned out to so great a distance. It has this advantage for the farmer over all other coloring plants, that it only requires to be taken up and dried, when it is fit for the dyer. It is, however, an exhausting crop.*

5378. *Weld will grow on any soil, but fertile loams produce the best crops. In Essex, it is grown on a stiff loam, moderately moist. The soil being brought to a fine tilth, the seed is sown in April or the beginning of May, generally broad-cast. The quantity of seed is from two quarts to a gallon per acre, and it should either be fresh, or if two or three years old, steeped a few days in water previously to being sown. Being a biennial, and no advantage obtained from it the first year, it is sometimes sown with corn crops in the manner of clover, which, when the soil is in a very rich state, may answer, provided also that hoeing, weeding, and stirring take place as soon the corn crop is cut. The best crops, however, will obviously be the result of drilling and cultivating the crop alone. The drills may be a foot asunder, and the plants thinned to six inches in the row. In the broad-cast mode, it is usual to thin them to six or eight inches distance every way: often when weld succeeds corn crops, it is never either thinned, weeded, or hoed, but left to itself till the plants are in full blossom.*

5379. *The crop is taken by pulling up the entire plant, and the proper period for this purpose is when the bloom has been produced the whole length of the stems, and the plants are just beginning to turn of a light or yellowish color; as in the beginning or middle of July in the second year. The plants are usually from one to two feet and a half in height. It is thought by some advantageous to pull it rather early, without waiting for the ripening of the seeds, as by this means there will not only be the greatest proportion of dye, but the land will be left at liberty for the reception of a crop of wheat or turnips; but in this case, a small part must be left solely for the purpose of seed. In the execution of the work the plants are drawn up by the roots in small handfuls, and set up to dry, after each handful has been tied up*



by one of the stalks, in the number of four together in an erect position against each other. Sometimes they, however, become sufficiently dry by turning without being set up. After they have remained till fully dry, which is mostly effected in the course of a week or two, they are bound up into larger bundles, that contain each sixty handfuls, and which are of the weight of fifty-six pounds each: sixty of these bundles constituting a load. These last, in places where this kind of crop is much grown, are tied up by a string made for the purpose, and sold under the title of weld cord.

5380. *The produce of weld* depends much on the nature of the season; but from half a load to a load and a half is the quantity most commonly afforded, which is usually sold to the dyers at from five or six to ten or twelve pounds the load, and sometimes considerably more. It is mostly bought by persons who afterwards dispose of it to the dyers occasionally, as they find it convenient. The demand for it is sometimes very little, while at others it is so great as to raise the price to a high degree. It is sometimes gathered green and treated like woad or indigo; but in general the dried herb is used by the dyers in a state of decoction.

5381. *The use of weld in dyeing* is for giving a yellow color to cotton, woollen, mohair, silk, and linen. Blue cloths are dipped in a decoction of it, which renders them green; and the yellow color of the paint, called Dutch pink, is obtained from weld.

5382. *To save seed*, select a few of the largest and healthiest plants, and leave them to ripen. The seed is easily separated.

5383. The chief disease of weld is the mildew, to which it is very liable when young, and this is one reason that it is often sown with other crops.

SUBJECT. 7. *The Bastard Saffron.* — *Carthamus tinctorius*, L. *Syngen. Polyg. Æqual. L.* and *Cynarocephalæ*, J. *Carthame*, Fr.; *Wilder Sofran*, Ger. (fig. 170.)

5384. *The bastard saffron* is an annual plant, which rises with a stiff ligneous stalk, two feet and a half or three feet high, dividing upwards into many branches, with ovate pointed sessile leaves. The flowers grow single at the extremity of each branch; the heads are large, enclosed in a scaly calyx; each scale is broad at the base, flat, and formed like a leaf of the plant, terminating in a sharp spine. The lower part of the calyx spreads open, but the scales above closely embrace the florets, which stand out near an inch above the calyx; these are of a fine saffron color, and this is the part which is gathered for the use of the dyer.

5385. *It grows naturally in Egypt* and some of the warm parts of Asia, but being an annual our summers admit of its going through a course of existence in this country. Sown in April, it flowers in July and August, and the seeds ripen in autumn; but if the season proves cold and moist, when the plants are in flower, there will be no good seeds produced; so that there are few seasons wherein the seeds of this plant come to perfection in England.

5386. *It is cultivated in great plenty in Germany*, and was formerly grown in England. In *Houghton's Collections*, it is related by a gentleman, in 1683, that twenty-five acres in the vale of Evesham, in Gloucestershire, was sowed with this seed; the soil a mixed sand of about fifteen shillings an acre value; it bore a crop of wheat the year before, was dressed for barley, and had a harrowing extraordinary. This piece of ground was taken for two years by an adventurer in this seed, at the rate of twenty-five pounds per acre, in consideration that this plant is said to be a great impoverisher of land. He sold the flowers in London for 10*l.* per pound; a price, he said, much below his expectation. He gained above thirty shillings an acre clear profit, excepting the price of the seed; but of this there was a plentiful return (about one hundred and forty bushels) which, had it been well managed, would have amounted to a considerable value. Like most other manufactory plants it is considered an impoverisher of the ground; both by exhausting it, and by affording but little haulm as manure.

5387. *The soil* it requires is light, and the preparation and culture, according to Von Thær, equal to that of the garden. The seed is sown in rows, or deposited in patches, two feet apart every way, and when the plants come up, they are thinned out, so as to leave only two or three together. The soil is stirred and wed during summer. In August the flowers begin to expand; the petals of the florets are then to be cut off with a blunt knife and dried in the shade, or on a kiln, like the true saffron. This operation is made in the early part of the day, and continued daily till October. The plants are then pulled up, sheaved and shocked, and threshed for their seed.

5388. *The use of the flower of bastard saffron* is chiefly in dyeing. It is also put in soups, pies, and puddings, like the leaves of the marigold or the common saffron. The oil produced from the seed is used both in medicine and painting. The stalks of the plant are commonly burnt as manure.

SUBJECT. 8. *Of various Plants which have been proposed as substitutes for the Thread, and dyeing Plants grown in Britain.*

5389. *Though few of these are likely to come into cultivation*, yet it may be useful to notice them with a view of indicating our resources for extraordinary occasions; leading the young cultivator to reflect on the richness of that immense store-house, the vegetable kingdom; and pointing out sources of experiment and research for the amateur agriculturist. Every kind of limitation has a tendency to degrade the mind, and lessen enterprise. The plants to be here enumerated, naturally arrange themselves as thread plants and coloring plants.

5390. *The thread plants* that have been tried are the *asclepias syriaca*, *urtica dioica*,

(or nettle), the spartium junceum, and scoparium (brooms), epilobium angustifolium, eriphorum polystachion, &c. The asclepias syriaca, Syrian swallow-wort, or Virginian silk, is a creeping-rooted perennial, with strong erect stems from four to six feet high. It is a native of Virginia, and flowers in July. The flowers are succeeded by pods, containing a down or cotton, which the poor people in Virginia collect and fill their beds with. In Germany, and especially at Leignitz, attempts were made, in 1790 and 1800, Von Thaeer informs us, to cultivate the plant as a substitute for cotton: the plant was found to grow readily on a poor soil, but the growers could not undersell the importers, nor produce so good an article. The eriphorum polystachion, or cotton grass, grows abundantly in our bogs, and its seeds are furnished with a cottony substance, gathered by the country people to stuff pillows, &c. This substance has been spun and wove into very good cloth. The common nettle affords a fibre which has also been spun and manufactured. The fibre of the spartium junceum, rush-like, or Spanish broom, a native of the south of Europe, but quite hardy in Britain, is made into very good cloth both in the south of France and in Spain. The fibre of the common broom makes an inferior description of cordage in the former country. The epilobium angustifolium, and other species of willow herb, common by the sides of brooks, affords a very good fibre, as do a great variety of plants: and in Sweden a strong cloth is made from the stems of the wild hop (*Humulus lupulus*), and the same thing has been done in England. (*Trans. Soc. Arts.* 1791.) It might be worth the attention of any one who had leisure to collect a few, say only two stalks, of a great number of species from a botanic garden, to immerse them a sufficient time in soft soap and warm water, and prove their absolute and comparative value as fibre plants.

5391. *Of coloring plants*, the number that may be, and even are employed, is almost endless. The reader has only to look into any botanical catalogue, and observe the number of plants whose specific name is formed from the adjective tinctorius; and still these, though numerous, are only a small part. On looking into *The Flora Britannica*, or *Flora Suecia*, he will there find a number of plants, trees, and even mosses and ferns used for dyeing. A number have been tried in this country and given up; as an instance we mention gallium verum, tried in 1789, (when the price of madder was high,) under the authority of the privy council for trade.

SECT. II. *Plants cultivated for the Brewery and Distillery.*

5392. Of plants grown expressly for their use in the brewery, the only one of consequence is the hop; the anise and carraway are grown on a very limited scale for the distillery.

SUBSECT. 1. *The Hop.* — *Humulus lupulus*, L. *Diœc. Pentan.* L. and *Urticeæ*, J. *Houblon*, Fr.; *Hoppen*, Ger.; *Lupulo*, Span.; and *Lupolo*, Ital. (*fig.* 594.)

5393. *The hop* is a perennial rooted plant, with an annual twining stem, which on poles or in hedges will reach the height of from twelve to twenty feet or more. It is a native of Britain, and most parts of Europe in hedges, flowering in June, and ripening its seeds in September. The female blossom is the part used: and as the male and female flowers are on different plants, the female only is cultivated. When the hop was first used for preserving beer, or cultivated for that purpose, is unknown; but its culture was introduced to this country from Flanders in the reign of Henry VIII. Walter Blith, in his *English Improver Improved*, 1649, the 3d ed., 1653, p. 240, has a chapter upon improvement by plantations of hops, &c. He observes that "hops were then grown to be a national commodity: but that it was not many years since the famous city of London petitioned the parliament of England against two antusancies, and these were Newcastle coals, in regard to their stench, &c., and hops, in regard they would spoyl the taste of drink, and endanger the people; and had the parliament been no wiser than they, we had been in a measure pined, and in a great measure starved, which is just answerable to the principles of those men who cry down all devices or ingenious discoveries, as projects, and thereby stifle and choak improvements."

5394. *The hop* has long been cultivated extensively in many parts of England, but not much in Scotland or Ireland. According to Brown, hops are not advantageous in an



agricultural point of view ; because much manure is abstracted by them, while little or none is returned. They are an uncertain article of growth, often yielding large profits to the cultivator, and as often making an imperfect return, barely sufficient to defray the expenses of labor. In fact, hops are exposed to many more diseases than any other plant with which we are acquainted ; and the trade affords a greater room for speculation, than any other exercise within the British dominions. (*Brown.*)

5395. There are several varieties of the hop. The writer of *The Synopsis of Husbandry* distinguishes them under the titles of the Flemish, the Canterbury, the Goldings, the Farnham, &c. and says, that the Flemish is held in the lowest estimation of any. It is, says he, of a smaller size, of a much closer texture, and of a darker green color than any of the rest, and grows on a red bind ; and has so near an affinity to the wild or hedge-hop, that it would never answer for cultivation, did it not possess the property of resisting the blast with greater vigor than the other kinds ; so that, in years when these last are covered with flies and lice, the Flemish hop appears strong and healthy. At picking time, likewise, this kind of hop, he says, takes less damage, either by the sun or rains, than any other ; and upon these accounts, it may answer the views of the planter to have a few acres of it, which will secure him a crop in a blasting season, when those of the more valuable class are destroyed, so as to be worth nothing.

5396. *The soils most favorable to the growth of hops* are clays and strong deep loams ; but it is also of great importance that the subsoil should be dry and friable, a cold, wet, tenacious, clayey understratum, being found extremely injurious to the roots of the plants ; as, when they penetrate below the good soil, they soon become unproductive, and ultimately decay. Bannister says, that a chalky soil is, of all others, the most inimical to the growth of this vegetable ; the reason of which he takes to arise from the dry and parching quality of the chalk, by which the roots are prevented from absorbing a quantity of moisture, equal to the supply of the vine or bind with sap during its growth ; for though a dripping summer is by no means kindly to the welfare of the hop, yet since the vine in a healthy state is very luxuriant, and furnished with a large abundance of branches, leaves, fruit, &c. it follows that the demand of moisture from the soil must be proportionably great to preserve the plant in health and vigor ; and for this reason the ground ought not to be deficient in natural humidity. Hence we generally find the most luxuriant vine growing on such land as is deep and rich, as moulds, &c. ; and in these grounds it is common, he says, to grow a load on an acre. But it is to be observed, however, that the abundance of fruit is not always in proportion to the length of the vines ; since those soils, which from their fertility cause a large growth of vine, are more frequently attacked with the blast than land of a shallower staple, where the vine is weaker and less luxuriant.

5397. But though rich moulds generally produce a larger growth of hops than other soils, there is one exception to this rule, where the growth is frequently eighteen or twenty hundred per acre. This is on the rocks in the neighborhood of Maidstone, in Kent, a kind of slaty ground, with an understratum of stone. On these rocks there is a large extent of hop-garden, where the vines run up to the tops of the longest poles, and the increase is equal to that on the most fertile soil of any kind.

5398. *The most desirable situation for a hop plantation* is ground sloping gently towards the south or south-west, and screened by means of high grounds or forest-trees, from the north and north-east. At the same time it ought not to be so confined as to prevent that free circulation of air which is indispensably necessary where plants grow so close together, and to such a height. A free circulation of air, in a hop-ground, not only conduces to the health and vigor of the plants, but also prevents the crops from being blighted, or what the hop-farmers call fire-blasted, which often happens towards the middle of a large close planted hop ground ; while the outides, in consequence of the more free circulation of air that there takes place, receive no injury whatever.

5399. Bannister asserts, that those fields that lie within a few miles of the sea, or in the neighborhood of marshy or fenny levels, are seldom favorable to the growth of hops, as such grounds generally miscarry in a blasting year ; and though, from the fertility of the soil, they may perhaps bring a plentiful crop in those seasons when the growth is general, such situation is by no means an eligible spot for a hop ground. In Worcestershire and Herefordshire hops are very generally grown between the rows of fruit trees in dug or ploughed orchards.

5400. *In preparing the soil previously to planting*, considerable attention is necessary by fallowing, or otherwise, to destroy the weeds, and to reduce the soil to as pulverised a state as possible. The ridges should also be made level, and dung applied with a liberal hand. The most effectual preparation is trenching either by the plough or by manual labor.

5401. *The mode of planting* is generally in rows, making the hills six feet distant from each other ; though there are some people who, from avaricious motives, prefer a five-foot plant. But as this vegetable, when advanced in growth, produces a large redundancy of bind or vine, and leaves, it should seem that six feet cannot be too wide a distance ; and that those which are planted closer will, from too confined a situation, be prevented from enjoying a free circulation of the air ; from which much injury may proceed, as blasts, mildews, mould, and other accidents, not to mention the disposition of the vine to house or grow together at the tops of the poles, whereby the hops are so overshadowed as to be debarred the influence of the sun, and thus not arrive to half their growth.

5402. *As the planters differ in their number of hills* to be made on the same given quantity of land, so are they no less capricious as to the manner of placing them ; some choosing to set them out with the most cautious regularity in rows of equal distances, whilst others prefer a triangular plant. The former method has this advantage over the other ; that the intervals may, in the early part of the summer, be kept clean by means of the cultivator and harrow, from which the latter is excluded by their irregular station ; and thus the ground must be tilled by the hoe at a great increase of charge, as the same labor

might be performed to as much advantage with one horse, a man, and a boy, who will do more work in a day than half a dozen laborers can with a hoe.

5403. The ordinary season for planting is spring, in February or March; but if bedded plants, or such as have been nursed for one summer in a garden are used, then by planting in autumn some produce may be had the succeeding year. But, according to the author of *The New Farmer's Calendar*, "the time for planting is commonly that of dressing and pruning the old vines when cuttings may be had, which is in March or April; but when root-sets are used, as on the occasion of grubbing up an old plantation, October to the beginning of November. But at whatever period they are planted, great care should be taken that the same sorts be planted together, as by this means there are advantages derived in their after-culture."

5404. *The plants or cuttings are procured* from the old stools; each should have two joints or eyes; from the one which is placed in the ground, springs the root; and from the other the stalk, provincially the bind; they should be made from the most healthy and strong binds, each being cut to the length of five or six inches. Those to be nursed are planted in rows a foot apart, and six inches asunder in a garden; and the others at once where they are to remain.

5405. *The mode of performing the operation of planting in Kent* is as follows: the land having been previously cleaned and prepared, dung is laid on the field in small heaps near the places where it is proposed to plant the hop slips or sets. These places are commonly marked off, by placing a number of stakes at proper and regular distances; that done, small pits are formed by taking out a spit or spade depth of earth; and the earth below being gently loosed, a certain quantity, about half a bushel, of dung is laid thereon; then the earth that was formerly taken out is again replaced, and so much added as to form a small hillock. On this hillock, five, six, or seven sets, procured from the roots or shoots of the old stock, are dibbled in. The plants are placed in a circular form towards the top of the hillock, and at the distance of five or six inches from each other. They are made to incline towards the centre of the hillock, where another plant is commonly placed.

5406. *Another mode of planting* is as follows: strike furrows with the plough equally distant, eight feet asunder; when finished, repeat the same across in the opposite direction, which will divide the piece into eight-foot squares. The hills are to be made where the furrows cross each other, and the horse-hoe may be admitted between the rows both ways. According to the Suffolk husbandry, the plantations are formed into beds sixteen feet wide, by digging trenches about three feet wide, and two or three feet deep; the earth that comes out being spread upon the beds, and the whole dug and levelled. Upon this they, in March, form the holes six feet asunder every way, twelve inches diameter, and a spit deep, by which three rows are formed on each bed. Into each hole they put about half a peck of very rotten dung, or rich compost; scatter earth upon it, and plant sets in each, drawing earth enough to them afterwards to form something of a hillock.

5407. *An interval crop* is generally taken the first summer of a hop plantation. Beans are very generally grown, and Bannister is of opinion that two rows of beans may be planted in each interval without any damage to the hops, whether bedded sets or cuttings. In the latter case, this method may be pursued the second year, at the end of which the vine from the cuttings will not be in a forwarder state than that from the bedded sets in the first autumn after planting. Others, however, think that neither beans, cabbages, or any other plants, except onions, should be put in.

5408. *The after-culture of the hop*, besides the usual processes of hoeing, weeding, stirring, and manuring, includes earthing-up, staking, and winter dressing.

5409. *Hoeing in hop plantations* may always be performed by a horse implement, and one in use for this purpose in the hop counties, is known by the name of hop-nidget, and of which the expanding horse-hoe (*fig.* 308.) is an improvement; when the hop-stools are formed in the angles of squares, the intervals may be hoed both lengthways and across, and nothing is thus left to be performed by manual labor but pulling out any weeds which may rise in the hills.

5410. *Stirring*, in the hop districts, is chiefly performed in winter by a three-pronged fork (provincially spud), but it might be equally well effected then or at any season of the year by the common plough, and the expanding horse hoe, set with coulter or prongs. With the use of the latter implement the soil might be stirred to any desirable depth, either in summer or winter; and by the use of the plough, the surface could be changed at discretion. Once going and returning would effect this, either by the paring or clearing out; that is, forming either a ridglet, or gutter between the rows, both lengthways and across. Twice or thrice going in the same direction would also succeed, and would be the preferable mode of covering in manure.

5411. *In the application of manure*, various modes are adopted. Some always use well rotten stable dung; others composts of earth and dung; and a few, littery dung. In laying it on, many prefer the autumn to the spring, and heap it on the hills without putting any between the rows. Others put it all between the rows, alleging that laying it on the hills encourages insects, exposes the dung to evaporation and loss, and sometimes, when mixed with earth, hinders the plants from coming up. A great deal will be found in favor and against each of these modes, in the numerous works on the culture of the hop, which have been written during three centuries; but it must be obvious to any person generally conversant with vegetable culture, that well-rotted stable dung must be the best kind for use; and early in spring the best season for laying it on; that little benefit can be derived by the roots when it is laid on the hills, and consequently

that it ought to be turned into the soil between the rows by the plough. Fifty cart loads of dung and earth, or thirty of dung, once in three years, is reckoned a good dressing; but some give ten or twelve loads every year. Too much dung renders the hops what are called mouldy, and with too little the crop will be poor and more liable to be eaten by insects.

5412. *Earthing-up* commences the first May after planting, whether that operation be performed in spring or autumn. By the end of that season, the young shoots have made some progress, and the earth is then drawn up to their roots from the surrounding intervals, in order to strengthen them. The next earthing-up is in autumn, when the hills are by some covered with compost or manure; but by such as prefer ploughing in the manure between the rows, this earthing-up does not take place. Some give an earthing-up of this kind in spring, and generally in February, chiefly to retard the plants, as that is found to render them less liable to disease, and the attacks of insects: for the shoots not beginning to grow till the weather is warm, they then shoot the more rapidly. In April and May, their progress is slow; but in June and July, when the nights are warm, they will grow nearly an inch in the hour. The only essential earthings up, however, are those given the first year in May, and those given annually whether in autumn or spring, and which indeed may be called replacings of earth, rather than earthing-up, after the operation of dressing, to be next described.

5413. *In dressing the hop plants*, the operations of the first year are confined to twisting and removing the haulm, to which some add cuping or earthing-up in autumn. The operation of twisting, is confined to such plants as have been planted in spring, and are not expected to produce any crop that season. It is performed in the end of June or in July, and consists in twisting the young vines into a bunch or knot; so that by thus discouraging their growth, the roots are enabled to spread out more vigorously, and to acquire strength previous to the approach of the winter season.

5414. *Removing the haulm* takes place soon after Michaelmas, and consists simply in cutting it over with a sickle, and carrying it off the field for litter, or burning. After this operation, some add cuping, or covering the hill with a compost, but this does not appear necessary, and is in many cases left undone.

5415. *The first year's dressing* of hops expected to produce flowers, such as those planted from bedded sets the preceding autumn, consists in supplying three or four half poles, that is, poles of four or five feet in length to each hill, and on removing the haulm in autumn, as in the other case.

5416. *The yearly dressing of established hop plantations* consists of what is provincially called picking. This operation is generally commenced on the return of good weather, in March, when the hills are spread out, in order to give opportunity to prune and dress the stocks. The earth being then cleared away from the principal roots by an iron instrument called a picker, the remains of the former years' vines are cut off, together with the shoots which were not allowed to attach themselves to the poles the former season, and also any young suckers that may have sprung up about the edges of the hills; so that nothing is allowed to remain that is likely to injure the principal roots, or impede their shooting out strong vigorous vines at the proper season. After the roots are properly cleaned and pruned, the hills are again formed, with an addition, if not every year, at least every second or third year, of a proper quantity of compost manure, that had been previously laid in small heaps on the hop-ground in the course of the winter, or in the early part of spring. At this season such sets are procured as may be wanted for the nursery, or for new plantations.

5417. *The yearly operation of stacking or setting the poles*, commences towards the end of April, or at whatever period, earlier or later, the shoots have risen two or three inches. The poles are straight slender shoots of underwood, ash, oak, chestnut, or willow, from sixteen to twenty feet high. These poles are set two, but more frequently three, to a hill: they are so placed as to leave an opening towards the south, to admit the sunbeams. The manner of fixing them is by making deep holes or openings in the ground with an iron crow. Into these holes the root-ends are put, when the earth is rammed so hard about them, that they very seldom alter from the position in which they were placed, except on occasion of very violent gales of wind. Great care is necessary in placing the poles, and no less judgment and experience in determining what ought to be the proper height. When very long poles are set in a hop-ground, where the stocks are too old or too young, or where the soil is of indifferent quality, the stocks are not only greatly exhausted, but the crop always turns out unproductive; as, till the vines reach the top, or rather till they overtop the poles, which depends on the strength of the stocks and the quality of the soil, the lateral branches on which the hops grow, never begin to shoot out, or make any progress.

5418. *Planters are much divided in their sentiments as to the number of poles to be set against each hill.* Three poles are the general allowance, observing to place the stoutest pole to the northern aspect of the hill; though it is no uncommon practice to set four poles, and in strong land five or six, to a hill. In behalf of this latter mode it is urged, that, where the land usually produces a great redundancy of vine, it is prudent to set a number of poles answerable to the luxuriance of the shoots. But, if a free circulation of the air be a matter of that importance to the well-being of a crop of hops, as is generally imagined, (and this is a doctrine which it is believed cannot be controverted), the incumbrance of the hills, with an additional number of poles, cannot fail to be of infinite dis-service to the future growth of the hops; and it will be readily acknowledged, that the quantity of hops on the same given number of hills will be more considerable, where three poles only are set up, than when the hills are crowded with a larger number; whether we consider the mischief likely to accrue from the stagnated air, or from the redundancy of the vine, by which the hops are prevented from arriving to their proper size or growth. The chief art in poling a hop-ground is, first, to pitch the hole to a proper depth, about twenty inches: next to set down the pole with some exertion of strength, so that the same being well sharpened may fix

itself firm at the bottom; thirdly, that the tops of the poles may stand in such a direction as to lean outwards from the hill, to prevent, as much as possible, the housing of the vine; and lastly, to tread the earth close to the pole with the foot. For want of regard to these particulars in the laborer, a moderate blast of wind will loosen the poles, so as not only to occasion a double expense, but the hazard of injuring the future crop is very great, by tearing asunder the vine, which, from its great luxuriancy, will become twisted together, or, as it is termed, housed at the extreme parts of the poles.

5419. *With respect to the species of woods proper for poles*, it is suggested that they appear to prefer a rough soft bark, to one which is more smooth and polished. An experienced grower particularises the maple, whose bark is peculiarly soft and warm; adding, that he has frequently observed, when the morning has been cold, the sensitive leader of a tender fresh-poled vine reclining its head against the velvet bark of the maple, while others held theirs aloof, from chilly smooth-barked poles. This is probably a general law, or ordinance of nature, to climbing plants; and may be essential to their preservation, showing, in a palpable manner, the perception and strength of vegetable instinct.

5420. And in regard to *the size of the pole*, hops, likewise, it is well known, have their instinctive choice or approbation, with respect to the thickness of their support; embracing, with greater readiness, a pole that is moderately small, than one which is thick at the bottom. The ordinary circumference of poles, at the thickest end, may be set down at six to nine inches, tapering to the size of a walking-cane at the top. And the length from fifteen to twenty feet, or upwards. Different grounds require different lengths of pole. In the rich grounds, in the neighborhood of Maidstone, the poles of grown hops stand, in general, from fourteen to sixteen feet above the hills, and have from eighteen inches to two feet beneath the surface. But, on weaker lands, poles are not seen to rise more than ten to twelve feet high. Hence, a variety of ground is convenient; as the poles, by decaying at the roots, grow shorter, and, in a course of years, get too short for strong vines, on rich land. They are, in this case, sold and transferred to less productive lands, and vines of humbler growth.

5421. *New poles have sometimes the bark shaved off*, under an idea that it saves them from the worm; while some men are of opinion, that there is a warmth in the bark, which is acceptable to the young vines; and although in two or three years the bark drops off, the surface of the wood has, by that time, acquired a degree of softness. Whether a hard, smooth, polished pole, is unfriendly to the hop or not, to peel the poles would evidently be improper, as promoting their decay.

5422. *Short light poles are usually pointed in hand*, without other support. But the tall heavy pole requires something to keep the top steady. This is simply had, by tying together three poles of equal length, two or three feet from their tops; and setting them up in the form of what are called triangles, in use for loading timber on wheel-carriages. The top of the pole to be sharpened, being dropped in between the points or horns of the triangles, receives the required stay; a block being placed in a convenient situation below, to work upon. And this sort of work, whether on new or on old poles, is sometimes done before they are stacked, or set up in piles; sometimes immediately before they are used. But in pointing poles that have been used, the part which stood in the ground the preceding year is struck off, if much tainted, and a fresh point given to the sound part. But, if the bottom part remain firm, it is sharpened again for another season.

5423. *Tying the shoots or vines to the poles* is the last operation in the after or summer culture of the hop. This requires the labor of a number of persons: women are generally employed, who tie them in several different places with withered rushes, but so loosely as not to prevent the vines from advancing in their progress towards the top of the poles. When the vines have got to such a height as to be beyond reaching with the hand, proper persons go round, and, using standing ladders, tie all the vines that appear inclined to stray from the poles.

5424. *The season for this operation* varies from the middle of May to the end of June, and one important part of the operation consists in selecting the shoots. The forwardest vine should always be extirpated, as it is well known that the branches arising from these early shoots will produce little, if any fruit. The second shoots, where the hills are not overloaded with plants, and where the ground is not of a nature to send forth a very luxuriant vine, may with safety be tied up. But where the land is apt to push forward a great redundancy of shoots, where the vine is always strong and vigorous, and where the failure in the crop chiefly arises from this cause, the greatest prudence is necessary, at the season for tying, to make choice of a proper vine; especially in years which may be supposed to be attended with a blast; such as those wherein an easterly wind has prevailed throughout the month of March, whence one may fairly conclude that the same weather will happen during the course on the month of May, which never fails to bring the long-winged fly. In such a season it would be well worth while to eradicate all the vine which first appears, and trust to a latter shoot, so as to protract the tying till the last week in May. This hint was taken from the observations made on the poor and thin lands in such blasting years where the vine is naturally backward, and seldom becomes fit for the tyers till towards the latter end of May, when that on the forward ground will have advanced nearly to the tops of the poles, and to an inattentive observer seems to promise fair for a crop; whereas, to those who have been conversant in these matters, the loss of the crop, though the vine at that time be green and flourishing, may be easily foreseen; whilst on the poorer soils there is generally a saving crop even in years when the blast is most prevalent. These considerations, he says, have suggested the protracting the growth of the vine in the manner above-mentioned, which seems conformable to reason and experience.

5425. *Taking the crop* is a most important operation in the hop economy. Hops are known to be ready for pulling when they acquire a strong scent, and the seeds become firm and of a brown color, which, in ordinary seasons, happens in the first or second week of September. And when the pulling season arrives, the utmost assiduity is requisite on the part of the planter, in order that the different operations may be carried on with regularity and dispatch; as the least neglect, in any department of the business, proves in a great degree ruinous to the most abundant crop, especially in precarious seasons. Gales of wind at that season, by breaking the lateral branches, and bruising the hops, prove nearly as injurious as a long continuance of rainy weather, which never fails to spoil the color of the crop, and thereby render it less saleable.

5426. *As a preparation for pulling the hops*, frames of wood, in number proportioned to the size of the ground, and the pickers to be employed, are placed in that part of the field which, by having been most exposed to the influence of the sun, is soonest ready. These frames, which are called *bins* or *cribs*, are very simple in the construction, being only four pieces of boards nailed to four posts, or legs, and, when finished, are about seven or eight feet long, three feet broad, and about the same height. A man always attends the pickers, whose business it is to cut over the vines near the ground, and to lay the poles on the frames to be picked. Commonly two, but seldom more than three, poles are laid on at a time. Six, seven, or eight pickers, women, girls, and boys, are employed at the same frame, three or four being ranged on each side. These, with the man who sorts the poles, are called a set. The hops, after being carefully separated from the leaves and branches, or stalks, are dropped by the pickers into a large cloth, hung all round within-side the frame on tenter-hooks. When the cloth is full, the hops are emptied into a large sack, which is carried home, and the hops laid on a kiln to be dried. This is always done as soon as possible after they are picked, as they are apt to sustain considerable damage, both in color and flavor, if allowed to remain long in sacks in the green state in which they are pulled. In very warm weather, and when they are pulled in a moist state, they will often heat in five or six hours: for this reason the kilns are kept constantly at work, both night and day, from the commencement to the conclusion of the hopping season.

5427. *To set on a sufficient number of hands*, is a matter of prudence, in the picking season, that the oasts or kilns may never be unsupplied with hops; and if it is found that the hops rise faster than could have been expected, and that there are more gathered in a day than can be conveniently dried off, some of the worst pickers may be discharged; it being very prejudicial for the green hops to continue long in the sacks before they are put on the oast, as they will in a few hours begin to heat, and acquire an unightly color, which will not be taken off in the drying, especially if the season be very moist; though, in a wet hopping, it is no easy matter to prevent the kilns from being overrun, supposing that there were pickers enough to supply them if the weather had been dry, because in a wet cold time the hops require to lie a considerable while longer on the kiln, in order that the superabundant moisture may be dried up. It is therefore expedient in this case that each measuring be divided into a number of green pockets or pokes. The number of bushels in a poke ought never to exceed eleven; but when the hops are wet, or likely to continue together some time before they go on the kiln, the better way is to put only eight bushels in a sack, pocket, or poke.

5428. *Donaldson* asserts, that diligent hop-pickers, when the crop is tolerably abundant, will pick from eight to ten bushels each in the day, which, when dry, will weigh about one hundred weight; and that it is common to let the picking of hop-grounds by the bushel. The price is extremely variable, depending no less on the goodness of the crop than on the abundance or scarcity of laborers. The greatest part of the hops cultivated in England are picked by people who make a practice of coming annually from the remote parts of Wales for that purpose.

5429. *The operation of drying hops* is not materially different from that of drying malt, and the kilns, or oasts, are of the same construction. The hops are spread on a hair-cloth, and from eight to ten, sometimes twelve, inches deep, according as the season is dry or wet; and depending also on the state of the hops in regard to ripeness. A thorough knowledge of the best method of drying hops can only be acquired by long practice. The general rules are to begin with a slow fire, and to increase it gradually, till, by the heat on the kiln, and the warmth of the hops, it is known to have arrived at a proper height. An even steady fire is then continued for eight or ten hours, according to the state or circumstances of the hops, by which time the ends of the hop-stalks become quite shrivelled and dry, which is the chief sign by which to ascertain that the hops are properly and sufficiently dried. They are then taken off the kiln, and laid in a large room or loft till they become quite cool; and they are now in condition to be put into bags, which is the last operation the planter has to perform previous to sending his crop to be sold.

5430. *When hops are dried on a cockle-oast*, sea-coal is the usual fuel, of which a chaldron is generally esteemed the proper allowance to a load of hops. On the hair kilns, charcoal is commonly used for this purpose. Fifty sacks of charcoal are termed a load, which usually sells for about fifty shillings. The price for burning is three shillings per load, or twelve shillings for each cord of wood. The process of drying having been completed, the hops are to be taken off the kiln, and shovelled into an adjoining chamber called the stowage-room; and in this place they are continually to be laid as they are taken off the kiln, till it may be thought convenient to put them into bags, which is rarely done till they have lain some time in the heap; for the hops, when first taken off the kiln, being very dry, would (if put into the bags at that time) break to pieces, and not draw so good a sample as when they have lain some time in the heap; whereby they acquire a considerable portion of toughness, and an increase of weight.

5431. *The bagging of hops* is thus performed:—in the floor of the room, where the hops are laid to cool, there is a round hole or trap, equal in size to the mouth of a hop bag. After tying a handful of hops in each of the lower corners of a large bag, which serve afterwards for handles, the mouth of the bag is fixed securely to a strong hoop, which is made to rest on the edges of the hole or trap; and the bag itself being then dropped through the trap, the packer goes into it, when a person who attends for the purpose, puts in the hops in small quantities, in order to give the packer an opportunity of packing and trampling them as hard as possible. When the bag is filled, and the hops trampled in so hard as that it will hold no more, it is drawn up, unloosed from the hoop, and the end sewed up, other two handles having been previously formed in the corners in the manner mentioned above. The brightest and finest colored hops are put into pockets or fine bagging, and the brown into coarse or heavy bagging. The former are chiefly used for brewing fine ales, and the latter by the porter brewers. But it is to be observed, that where hops are intended to be kept for any length of time, it is most proper to put them into coarse cloth. The proper length of a bag is two ells and a quarter, and of a pocket nearly the same, being one ell in width. The former, if the hops are good in quality, well cured, and tight trodden, will weigh about two hundred and a half; and the latter, if of the Canterbury pocketing, about one hundred and a half. If the weight either exceeds or falls much short of this medium, it induces a surmise, that the hops are

either in themselves of an inferior quality, or have been injudiciously manufactured in some respect or other.

5432. *The stripping and stacking of the poles* succeeds to the operation of picking. It is of some consequence that this business be executed as soon as possible after the crop is removed; not only that the poles may be much safer from thieves when set up in stacks, but that in such form they may take far less damage by the weather than when dispersed about the ground with the vine on them. The usual price for stripping and stacking is five shillings per acre. At this time, such poles as may be deemed unfit for further service should be flung by, that the planter may have an early knowledge of the number of new poles which will be wanting; and thus the business of bringing on the poles may be completed in the winter time, when the horses are not required about other labor; and these new poles may be drawn from the wood on the ground, and adjusted to the separate stacks, as the state of the different parts of the ground may require, and the whole business be completed before the poling season: whereas, when this method of flinging out the old poles is neglected at the stacking, the planter being ignorant of the number of new poles that will be required for the ensuing year, often finds at the poling season that he has not laid in a sufficient stock.

5433. *In performing the operation of stacking* the poles are set up in somewhat conical piles, or congeries, of two to five hundred each. The method of proceeding is this: three stout poles of equal length are bound together, a few feet from their tops, and their feet spread out, as those already mentioned for pointing the poles. These serve as a stay to the embryo pile; the poles being dropped in on each side, between the points of the first three; cautiously keeping an equal weight on every side; for, on this even balance, the stability of the stack depends. The degree of inclination or slope, and the diameter of the base of the pile, vary with the length and the number of poles set up together. A stack of three or four hundred of the long poles of the environs of Maidstone, occupy a circle of near twenty feet in diameter. It is observable, however, that the feet of the poles do not form one entire ring; but are collected in bundles or distinct divisions, generally from three to six or eight in number; each fasciculus being bound tightly together, a few feet from the ground, with a large rough rope made of twisted vines, to prevent the wind from tearing away the poles; and the openings between the divisions give passage to violent blasts, and tend to prevent the piles from being thrown down in a body; a circumstance which does not often take place in screened grounds. But, on the high exposure of Cox Heath, where great quantities of new poles brought out of the Weald are piled for sale among the Maidstone planters, it is not uncommon for the piles to be blown down, and to crush in their fall the sheep or other animals that may have taken shelter under them. A caution, this, to the inexperienced in the business of stacking; and an apology, if one is wanted, for the minuteness of the detail.

5434. *The operation of stripping* is generally performed by women; being nothing more than tearing off the bind or vines. Many people burn it on the ground. Others suffer it to be carried off by their workmen for firing; and there are some, who tie it up into small bundles, which they bring home and form into a stack, to answer the purpose of bays in heating their ovens or coppers.

5435. *The produce of the hop crop* is liable to very considerable variation, according to soil and season, from two or three to so much as twenty hundred weight; but from nine to ten, on middling soils, in tolerable seasons, are considered as average crops, and twelve or fourteen good ones. Bannister asserts, that sixty bushels of fresh gathered hops, if fully ripe, and not injured by the fly or other accident, will, when dried and bagged, produce a hundred weight. Where the hops are much eaten by the flea, a disaster which often befalls them, the sample is not only reduced in value, but the weight diminished; so that, when this misfortune occurs, the planter experiences a two-fold loss.

5436. *To judge of the quality of hops*, as the chief virtue resides in the yellow powder contained in them, which is termed the condition, and is of an unctuous and clammy nature, the more or less clammy the sample appears to be, the value will be increased or diminished in the opinion of the buyer. To this may be added the color, which it is of very material consequence for the planter to preserve as bright as possible, since the purchaser will always insist much on this article; though, perhaps, the brightest colored hops are not always the strongest flavored.

5437. *The duration of the hop plantation* on good soil may be from fifteen to thirty years; but in general they begin to decline about the tenth year. Some advise that the plantation should then be destroyed and a fresh one made elsewhere; others consider it the best plan to break up and plant a portion of new ground every two years, letting an equal quantity of the old be destroyed, as in this way a regular succession of good plantation will be kept up at a trifling charge.

5438. *The expenses of forming new hop-plantations* is in general very great, being estimated, in many districts, at from not less than seventy to a hundred pounds the acre. The produce is very uncertain; often very considerable; but some seasons nothing, after all the labor of culture, except picking, has been incurred. Where the lands are of the proper sort for them, and there are hop-poles on the farm, and the farmer has a sufficient capital, it is probably a sort of husbandry that may be had recourse to with advantage; but under the contrary circumstances, hops will seldom answer. In growing them in connection with a farm, regard should be had to the extent that can be manured without detriment to the other tillage lands. On the whole, hops are an expensive and precarious crop, the culture of which should be well considered before it is entered upon.

5439. *The use of the hop in brewing* is well known: their use is to prevent the beer from becoming sour. In domestic economy the young shoots are eaten early in the

spring as asparagus, and are sold under the name of hop-tops; they are said to be diuretic, and to be good against the scurvy, taken in an infusion. The herb will dye wool yellow. From the stalks a strong cloth is made in Sweden: for this purpose they must be gathered in autumn, soaked in water all winter; and in March, after being dried in a stove, they are dressed like flax. They require a longer time to rot than flax, and if not completely macerated, the woody part will not separate, nor the cloth prove white or fine. Hence a farmer who has a hop plantation need neither grow asparagus nor flax, and may, when the flowers fail from disease, separate the fibre from the vine, and employ the poor, or machinery, in spinning and weaving it. A decoction of the roots of hops is considered as good a sudorific as sarsaparilla; and the smell of the flowers is found to be soporific. A pillow filled with hops was prescribed for the use of Geo. III. in his illness of 1787.

5440. *The hop is peculiarly liable to diseases.* There is scarcely any sort of plant cultivated as a field-crop that is more liable to become diseased than the hop. It is apt, in the very early stage of its growth, to be devoured, as it rises above the surface of the ground, by the ravages of an insect of the flea kind. At a more advanced stage, it is subject to the still more injurious effects of the green or long-winged fly, red spider, and otter moth: the former, by the depositing of their ova, afford the means of producing lice in great abundance; by which the plants are often very greatly, if not wholly, destroyed, and the larvæ of the latter prey upon the roots, and thus render the plants weak and subject to disease. The honey-dew is another disease to which the hop is exposed about the same time, and by which it is often much injured. The mould occurs in general at a somewhat later period, being equally injurious. Hop-crops are also exposed to other injuries, as the blight, and fire-blast, but which take place at different times, though mostly towards the latter periods of the growth of the plants.

5441. With regard to *the flea*, which is said to be an insect of the same kind as that which is so prejudicial to the young turnip, it is observed to make the greatest havoc in seasons where the nights are cold and frosty, and the days hot and inclined to be dry; eating off the sweet tender tops of the young plants; and which, though not wholly destroyed, shoot forth afterwards in a far less vigorous manner, and of course become more exposed to diseases. It has been found to commit its depredations most frequently on the plants in grounds that have been dunged the same year; on which account it has been suggested that the manure employed for the purpose of covering the hills should be previously well mixed and incorporated as directed above (5411.); and that it should be applied either over the whole of the land, or only the hills, as soon as possible after the plants have been cut over; but the former practice is probably the best. It makes its greatest depredations in the more early cold spring months, as the latter end of April and beginning of the succeeding month, disappearing as the season becomes more mild and warm. In these cases, the principal remedy is that of having the land in a sufficient state of fertility, to enable the young plants to shoot up with such vigor and rapidity as to become quickly incapable of being fed upon and devoured by the insect. And the frequent stirring of the mould about the roots of the plants by the hoe may be of utility in the same view.

5442. With respect to the *green or long-winged fly*, it mostly makes its appearance about the latter end of May, and in the two succeeding months; being supposed to be produced by the prevalence of north-easterly winds about that period. It is highly destructive to the young leaves of the plants. They are said, under such a state of the wind, to scarcely ever fail covering the leaves; and, by dropping their ova, producing an abundance of lice, by which the crops are often much injured; as when they have once obtained complete possession of the plants, they seldom or ever leave them before they are wholly destroyed. The forwardest and most luxuriant hop-vines are in general the most disposed to be attacked by insects of this sort. Their removal chiefly depends upon a change taking place in the wind more to the south, and the setting-in of more mild, warm, and temperate weather.

5443. It has been found that the *otter moth*, by depositing its eggs upon the roots of the plants, renders them liable to be attacked by the larvæ, and the healthy growth of the hops to be thereby greatly impaired, the crops being of course much injured in their produce. Stirring the earth well about the roots of the plants may probably sometimes be serviceable in cases of this kind.

5444. *The honey-dew* mostly occurs after the crops have been attacked by some of these kinds of insects, and when the weather is close, moist, and foggy. In these cases, a sweet clammy substance is produced upon the leaves of the plants, which has the taste of honey, and they have at first a shining appearance, but afterwards soon become black. It is a disease that mostly happens in the more forward crops; and the chief dependence of the planter for its removal, according to Bannister, is that of heavy thunder showers taking place; as by this means, when the destruction of the hops has not proceeded too far, they are often much restored, the insects that devour the leaves and vines being greatly destroyed, the growth of fresh shoots promoted, and a favorable bloom brought on the plants.

5445. It is well known that the *flea, mould, or mildew*, is a disease to which the hop-crop is exposed at a later period of its growth, and which chiefly attacks the part where the hop is attached to the stem. It is said that its production is greatly promoted by moist damp weather, and a low situation; those hop-crops, that grow on low, close, rich grounds, being the most liable to be attacked by it: and it is found to soon spread itself over the whole crop, after it has once seized upon any part of it. The nature of this vegetable disease has not been yet sufficiently investigated; it has been suggested by Darwin and Willdenow to be a plant of the fungus kind, that is capable of growing without light or change of air, attaching itself to plants already in a morbid condition, and by its roots penetrating their vessels. And on this supposition, the best remedy is believed to be that of thinning the plants, in order to afford a more free circulation of air, and admit the light more extensively; by which the vigor of the hop-plants may be restored, and the disease be of course removed. In this view, it is probable, by planting the hills more thinly, and making them at greater distances from each other, the disease might in some measure be prevented from taking place. (See 1638.)

5446. *Diseases termed blights* are frequently met with in hop-crops, at different periods of the growth of the plants, but mostly in the more early stages of their rising from the hills, while the nights are cold and frosty in the spring months, and the days have much sun and heat; by which the living powers of the plants are greatly exhausted in the day-time by the stimulus of heat, and of course much injured, or wholly destroyed in the nights, from being exposed to a freezing air, which is incapable of exciting the actions, which are necessary for the preservation of vegetable life. As the presence of this disease is

supposed to be greatly connected with the prevalence of winds from the northern or easterly quarters, there is often a flea produced of a similar kind to that which attacks the shoots in their early growth. (5441.) It is highly injurious, by preying upon the nutriment of the blossoms, and thereby diminishing their weight and changing them to a brown color, which is very prejudicial in their sale at the market.

5447. *The fire-blast* is a disease that hop-crops are exposed to, in the later periods of their growth, and generally supposed to proceed from the particular state of the air or weather. It has been conjectured to be the effect of lightning, as it takes place, for the most part, at those seasons when it is the most prevalent, and in a very sudden manner: and besides, the most forward and most luxuriant vines are the most subject to be affected. It has been suggested, that in exposures that are particularly liable to have the crops thus injured, it may be advisable to plant thinner, to keep back the growth of the plants as much as possible, by extirpating all the most forward shoots, and to employ a less proportion of the earthy compost in their culture.

5448. *In respect to the duty on hops*, it is best for the planter to have the acts before him. But every grower of hops in Britain is legally obliged to give notice to the excise, on or before the first day of September, of the number of acres he has in cultivation; the situation and number of his oasts; the place or places of bagging, which, with the store-rooms, or warehouses, in which the packages are intended to be lodged, are entered by the revenue officer. No hops can be removed from the rooms thus entered before they have been weighed and marked by a revenue officer; who marks, or ought to mark, not only the weight, but the name and residence of the grower, upon each package.

SUBJECT. 2. *Of the Culture of the Coriander and Caraway (fig. 595 a, b).*

5449. *The coriander*, (*Coriandrum sativum*, L. fig. 595 a), is a small rooted annual, with branching stems rising from one to one and a half feet in height. It is a native of the south of Europe, and appears to be naturalized in some parts of Essex, where it has been long cultivated. It flowers in June and July, and the seeds ripen in July and August.

5450. *The culture and management of coriander*, consists in sowing it on a light rich soil in September, with seeds ripened the same year. Twenty pounds of seed will sow an acre. When the plants come up, thin them to six or eight inches distance every way, and next spring, stir the soil with a pronged hoe. In August the seed will be ripe, and if great care be not used, the largest and best part of it will be lost. To prevent this, women and children are employed to cut plant by plant, and to put it immediately into cloths, in which it is carried to some convenient part of the field, and there threshed upon a sail-cloth. A few strokes of the flail get the seeds clean out, and the threshers are ready for another bundle in a few minutes. In Essex it is sometimes cultivated with caraway and teasle. (See Caraway.)

5451. *The produce of coriander* is from ten to fourteen cwt. on an acre. It is used by the distillers for flavoring spirits; by the confectioners for incrusting with sugar; and by the druggists for various purposes, for all of which it is said to have a ready sale.



5452. *The Caraway* (*Carum carui*, b) is a biennial plant with a taper root, like a parsnep, but much smaller, running deep into the ground. The stems rise from eighteen inches to two feet, with spreading branches and finely cut deep green leaves. It is a native of England, in rich meadows in Lincolnshire and other places, and has been long cultivated in Essex. It flowers in May and June, and the seeds ripen in autumn.

5453. *The culture and management* is the same as that of coriander. In all probability both plants would answer if sown like clover among a crop of corn; hoed and thinned when the crop was removed, and again in the following spring. The method of culture in Essex is, about the beginning of March to plough some old pasture land: if it has been pasture for a century the better; and the soil should be a very strong clayey loam. Twelve pounds of caraway seed are mixed with ten pounds of coriander, and twelve pounds of teasle seed: this is sufficient for one acre; and is sowed directly after the plough, harrowing the land well. When the plants appear of sufficient strength to bear the hoe, which will not be until about ten weeks after sowing, it must not be omitted; and in the course of the summer, the crop will require three hoeings, besides one at Michaelmas. The coriander being annual, will be fit to cut about the beginning of July. It is left in the field after cutting, and threshed on a cloth in the same manner as rape seed. About April following the caraway and teasle will want a good hoeing done deep and well; and another about the beginning of June. The caraway will be fit to cut the beginning of July, and must be threshed in the same manner as the coriander. This compound crop is mostly sown on land, so strong, as to require being a little exhausted to make it fit for corn. Caraway and coriander are oftenest sown without teasle: the latter being a troublesome and uncertain crop, and the produce of caraway much greater without it.

5454. *The produce of caraway*, on the very rich old leys in the hundreds or low lands of Essex, has often been twenty cwt. to the acre. There is always a demand for the seed in the London market.

5455. *The uses of the caraway* are the same as those of coriander, and its oil and other preparations are more used in medicine. Dr. Anderson says, both the roots and tops may be given to cattle in spring.

SUBJECT. 3. *Of Plants which may be substituted for Brewery and Distillery Plants.*

5456. There are a great many plants with bitter juices which are or may be substituted for hops. In Sweden, Norway, and the north of Scotland, the heath (*Erica*, L.) and common broom, were, and still are, occasionally used for that purpose. In some parts of France and Germany nothing else is used but broom tops. In Guernsey, the *Teucrium scordonia* is used and found to answer perfectly. In England, the different species of mugwort and

wormwood have been used for that purpose; and the foreign bitter, quassia, a tree of Guiana, is still used by the porter brewers. Whoever has good malt, therefore, or roots, or sugar, and understands how to make them into beer, need be at no loss for bitters to make it keep.

5457. Of the *carminative seeds* there are a very considerable number of native or hardy plants that furnish them of equal strength, with those of the caraway and coriander, and of flavors to which the drinkers of cordials and liqueurs are also attached. Such, are the fennels (*Fœniculum*), cultivated in Germany, parsley, myrrh, angelica, celery, carrot, parsnep, cow parsnep, and many other umbelliferous plants, avoiding, however, the hemlock, fool's parsley, æthusa, and some others which are poisonous. In Dantzic, where perhaps, more seeds are used for flavoring spirits than any where else, several of the above and other plants are employed. Kümmel, their favorite flavor, is that of the cumin (*Cuminum cymimum*), an annual plant, a native of Egypt, and cultivated in the south of Europe; but too tender for field culture in this country. But caraway or fennel seeds are very generally mixed with cumin, or even substituted for it in distilling kümmel-wasser.

SECT. III. Of Oil Plants.

5458. In Britain there are *few plants grown solely for the production of oil*; though oil is expressed from the seeds of several plants, as the flax, hemp, &c. grown for other purposes. Our chief oil plant is the rape.

5459. Rape is the *Brassica napus*, L.; *Navette*, Fr.; *Rübsamen*, Ger.; *Naba silvestre*, Span.; and *Rapa silvatica*, Ital. It is a biennial plant of the turnip kind, but with a caulescent or woody fusiform root, scarcely fit to be eaten. Von Thaer considers the French and Flemish colza (*Kohlsaas*, Ger.) a different plant from our rape; colza is more of the cabbage kind, and distinguished by its cylindrical root, cut leaves, and greater hardness. Decandolle seems to be of the same opinion.

5460. According to these writers, *Brassica campestris oleifera* is the colsat or colza, or rape of the continent, the most valuable plant to cultivate for oil; its produce being to that of the *Brassica napus*, or British colsat or rape, as 955 to 700. It is distinguished from the *B. napus* by the hispidity of its leaves. It would be desirable for agriculture, Decandolle observes, that in all countries, cultivators would examine whether the plant they rear is the *B. campestris oleifera* or the *B. napus oleifera*, which can easily be ascertained by observing whether the young plant is rough or smooth; if hispid, it is the *B. campestris*; if glabrous, the *B. napus*. Experiments made by Gaujuc, shew the produce of the first, compared to that of the second, to be as 955 to 700. (*Hort. Trans.* v. 23.)

5461. For its leaves as *food for sheep*, and its seeds for the oil manufacturer, rape, or coleseed, has been cultivated from time immemorial. It is considered a native, flowers in May, and ripens its seeds in July. It may be grown by sowing broad-cast, or in rows, like the common turnip, or transplanted like the Swedish turnip. The culture of rape for seed has been much objected to by some, on account of the great degree of exhaustion of the land that it is supposed to produce; but where it is grown on a suitable soil and preparation with proper attention in the after-culture, and the straw and offal, instead of being burnt, as is the common practice, converted to the purposes of feeding and littering cattle, it may, in many instances, be the most proper and advantageous crop that can be employed by the farmer.

5462. The soils best suited for rape are the deep, rich, dry, and kindly sorts; but, with plenty of manure and deep ploughing, it may be grown in others. Young says, that upon fen and peat soils and bogs, and black peaty low grounds, it thrives greatly, and especially on pared and burnt land, which is the best preparation for it; but it may be grown with perfect success on the fenny, marshy, and other coarse waste lands, that have been long under grass, after being broken up and reduced into a proper state of preparation. As a first crop on such descriptions of land, it is often the best that can be employed. The author of *The New Farmer's Calendar* thinks, that this plant is not perhaps worth attention on any but rich and deep soils; for instance, those luxuriant slips that are found by the sea-side, fens, or newly broken grounds, where vast crops of it may be raised.

5463. The preparation of old grass lands, if not pared and burned, need be nothing more than a deep ploughing and sufficient harrowing to bring the surface to a fine mould; and this operation should not be commenced in winter as some recommend, on account of the grub and wire-worm having time to rise to the surface; but in February or March, immediately before sowing, or in July or after the hay crop is removed, if the sowing is deferred till that season. When sown on old tillage lands, the method of preparation is pretty much the same as that which is usually given for the common turnip: the land being ploughed over four or five times, according to the condition it may be in, a fine state of pulverisation or tilth being requisite for the perfect growth of the crop. In

this view, the first ploughing is mostly given in the autumn, in order that the soil may be exposed to the influence of the atmosphere till the early part of the spring, when it should be again turned over twice, at proper intervals of time; and towards the beginning and middle of June one or two additional ploughings should be performed upon it in order that it may be in a fine mellow condition for the reception of the seed.

5464. *The place in a rotation of crops, which rape occupies, is commonly between two of the culmiferous kind. On rich soils it may be succeeded to the greatest advantage by wheat, as it is found to be an excellent preparation for that sort of grain; and by its being taken off early, there is sufficient time allowed for getting the land in order for sowing wheat.*

5465. *The season of sowing rape is the same as that for the common turnip, and the manner, whether in broad-cast or rows, the same. The row method on the flat surface seems the best for newly broken up lands, and the rows on ridglets, with or without manure, the best for lands that have been under the plough. Where the object is the keep of sheep in autumn or winter by eating it down, the broad-cast method and thick sowing is evidently the best, and is that generally resorted to in Lincolnshire and the fenny districts. The quantity of seed when sown thick may be a peck an acre, but when drilled or sown thin, two or three pounds will suffice. The seed should be fresh, black, and plump. Vacancies may always be filled up by transplanting.*

5466. *The season of transplanting begins as soon after the corn harvest as possible, being generally performed on the stubble of some description of corn crop. One deep ploughing, and a sufficient degree of harrowing to pulverise the surface, is given, and the plants may be dibbled in in rows a foot apart, and six inches in the row or narrower, according to the lateness of the season of planting, and the quality of the soil; for it must be considered that plants transplanted so late as September or October will be far from being so strong the succeeding spring, as those sown in June and left where they are to run. The seed-bed from which the plants are obtained should have been sown in the June or July preceding the transplanting season, and may be merely a ridge or two in the same or in an adjoining field. We have already noticed (457.) the Flemish mode of transplanting by laying the plants in the furrow in the course of ploughing, but as the plants cannot be properly firmed at the lower part of the root, we cannot recommend it.*

5467. *The after-culture of rape is the same as that of the turnip, and consists in hoeing and thinning. The plants on the poorer soils may be left at six or eight inches apart or narrower, but on the rich they may be thinned to twelve or fifteen inches with advantage to the seed. Few are likely to grow the plant on ridglets with manure; but if this were done, the same distance as for turnips will ensure a better crop of seed than if the plants were closer together. In close crops the seed is only found on the summits of the plants; in wide ones on rich soils, it also covers their sides. When rape seed is grown purposely for sheep keep, no hoeing, thinning, or weeding, are necessary. Rape grown for seed will not be much injured by a very slight cropping by sheep early in the autumn, but considerably so by eating down in winter, or the succeeding spring. The seed begins to ripen in the last week of June, and must then be protected as much as possible from birds.*

5468. *In harvesting rape great care is requisite not to lose the seed by shaking, chaffing, or by exposing it to high winds or rains.*

5469. *It is reaped with the hook, and the principal point is to make good use of fine weather; for as it must be threshed as fast as reaped, or at least without being housed or stacked like other crops, it requires a greater number of hands in proportion to the land, than any other part of husbandry. The reaping is very delicate work, for if the men are not careful, they will shed much of the seed. Moving it to the threshing-floor is another work that requires attention; one way is to make little waggons on four wheels with poles, and cloths strained over them; the diameter of the wheels about two feet, the cloth body five feet wide, six long, and two deep, and drawn by one horse, the whole expense not more than 30s. or 40s. In large farms, several of these may be seen at work at a time in one field. The rape is lifted from the ground gently, and dropt at once into these machines without any loss; they carry it to the threshers, who keep hard at work, being supplied from the waggons as fast as they come, by one set of men, and their straw moved off the floor by another set; and many hands of all sorts being employed, a great breadth of land is finished in a day. Some use sledges prepared in the same way. All is liable to be stopped by rain, and the crop much damaged; it is, therefore, of very great consequence to employ as many people as possible, men, women, and boys, to make the greatest use of fine weather. The seed is likewise sometimes cleaned in the field, and put into sacks for the market. But when large quantities of seed are brought quickly together, as they are liable to heat and become mouldy, it may be a better method to spread them out thinly over a barn, granary, or other floor, and turn them as often as may be necessary.*

5470. *The produce where the plant succeeds well, and the season is favorable for securing the seed, is forty or fifty bushels or more on the acre. Marshal thinks, indeed, that on the whole it may be considered as one of the most profitable crops in husbandry. There have been, says he, instances, on cold unproductive old pasture-lands, in which the produce of the rape crop has been equal to the purchase value of the land. The*

seed is sold by the last of ten quarters, for the purpose of having oil expressed from it, by mills constructed for that use. The price varies considerably, but has lately seldom been much below 30*l.* the last.

5471. *The use of the seed for crushing for oil is well known; it is also employed as food for tame birds, and sometimes it is sown by gardeners, in the same way as mustard and cress, for early salading.*

5472. *The rape-cake and rape-dust, the former adhering masses of seed husks, after the oil has been expressed, and the latter loose dry husks, are used as a top dressing for crops of different kinds. They are reduced into powder by a malt mill, or other grinding machine, and sometimes sown broad-cast over young clovers, wheats, &c. and at other times drilled along with turnip seed. Four cwt. of powder sown with turnip seed in drills, will go over one acre, but three times the quantity is required for an acre sown broad-cast. Experience has proved, that the success of this manure depends in a great measure on the following season. If rain happens to fall soon after the rape-dust is applied, the crop is generally abundant, but if no rain fall for a considerable period the effects of this manure are little discernible, either on the immediate crop, or on those which succeed it. There are turnip drills contrived so as to deposit the manure along with the seed. (2560.)*

5473. *The use of the husks to cattle in winter is very considerable. The stover (pods and points broken off in threshing) is as acceptable as hay, and the tops are eaten with an avidity nearly equal to cut straw, at least better than wheat straw. When well got, the smaller stalks will be eaten up clean. The offal makes excellent litter for the farm-yard, and is useful for the bottoms of mows, stacks, &c. The haulm of this plant is frequently burned; and, in some places, the ashes, which are equal to potash, are sold; by which practice, if no manure be substituted, the soil must be greatly deteriorated. It is a custom in Lincolnshire, sometimes to lay lands down with cole, under which the grass seeds are found to grow well. But this sort of crop, as has been already observed, is most suited to fresh broken-up or burned lands, or as a successor to early pease, or such other green crops as are mowed for soiling cattle.*

5474. *The use of the leaves as a green food for sheep, is scarcely surpassed by any other vegetable, in so far as respects its nutritious properties, and that of being agreeable to the taste of the animals; but in quantity of produce, it is inferior to both turnips and cabbages. In this view the crops are fed off occasionally from the beginning of November to the middle of April: being found of great value, in the first period, in fattening dry ewes, and all sorts of old sheep; and, in the latter, for supporting ewes and lambs. The sheep are folded upon them in the same manner as practised for turnips, in which way they are found to pay from 50*s.* to 60*s.* the acre; that quantity being sufficient for the support of ten sheep, for ten or twelve weeks, or longer, according to circumstances. Rape has been found, by experience, to be superior to turnips in fattening sheep, and, in some cases, even to be apt to destroy them by its fattening quality. In *The Corrected Report of Lincolnshire*, it is likewise observed, that that which is grown on fresh land has the stem as brittle as glass, and is superior to every other kind of food in fattening sheep; while in that produced on old tillage land, the stem is tough and wiry, and has comparatively little nourishment in it.*

5475. *Among other plants which may be cultivated by the British farmer as oil plants, may be mentioned all the species of the Brassica family, the Sinapis or mustard family, and the Raphanis or radish family, with many others of the natural order of cruciferae. The seeds of these plants, when they remain too long on the seedsman's hands for growing, are sold either for crushing for oil, or grinding with mustard seed. This includes a good deal of wild charlock and wild mustard seed, which is separated in the process of cleaning grain by farmers, among whose corn these plants abound, and sold to the seed agents, who dispose of it to the oil or mustard millers. Various other cruciferae, as the *Myragrum sativum*, *Raphanus chinensis*, var. *oleiferus*, both cultivated in Germany, the *Erysimum*, *Sisymbrium officinale*, *Turrites*, &c. might also be cultivated for both purposes.*

5476. *The small or field poppy (*Papaver Rheas*; *Oilette*, Fr.), and also the Maw seed (*P. somniferum*, var. *Pavot*, Fr.), a variety of the garden poppy, are, as we have seen (460.), cultivated on the continent as oil plants. The oil being esteemed in domestic economy next to that of the olive. Other species might be grown for the same purpose, all of them being annual plants require only to be sown on fine rich land in April; thinned out when they come up, to six or eight inches distance, according to the species; kept clear of weeds till they begin to run, and as the capsules ripen to be gathered by hand, and dried in the sun.*

5477. *The sunflower (*Helianthus annuus*; *Turnesol*, Fr., and *Girasole*, Ital.) has been cultivated in Germany for its seeds, which are found to yield a good table oil, and its husks are nourishing food for cattle.*

SECT. IV. *Plants used in Domestic Economy.*

5478. *Among agricultural plants used in domestic economy, we include the Mustard, Canary, Buck-wheat, Cress, Tobacco, Chicory, and a few others; with the exception of the two first, they are grown to a very small extent in Britain, and therefore our account of them shall be proportionately concise.*

SUBJECT. 1. Mustard. — *Sinapis*, L. *Tetrad. Siliq. L.* and *Cruciferae*, J. *Moutarde* or *Sénévé*, Fr.; *Senf*, Ger.; *Mostaza*, Span.; and *Senapa*, Ital.

5479. There are two species of mustard in cultivation in the fields, the white mustard (*Sinapis alba*, fig. 596 a), and the black or common (*Sinapis nigra*, b). Both are annuals, natives of Britain and most parts of Europe, and cultivated there and in China, for an unknown period. White mustard flowers in June, and ripens its seeds in July. Black mustard is rather earlier. Mustard is an exhausting crop, but profitable when the soil answers, and especially in breaking up rich loamy lands, as it comes off earlier, and allows time for preparing the soil for wheat. In breaking up very rich grass lands, three or four crops are sometimes taken in succession. It cannot however be considered as a good general crop for the farmer, even if there was a demand for it, as, like most of the commercial plants, it yields little or no manure. The culture of black or common mustard is by far the most extensive, and is chiefly carried on in the county of Durham. The seed of the black mustard, like that of the wild sort, and also of the wild radish, will remain in the ground, if below the depth of three or four inches, for ages without germinating, hence, once introduced it is difficult to extirpate. Whenever they throw the earth out of their ditches in the Isle of Ely, the bank comes up thick with mustard; the seed falling into the water and sinking to the bottom, will remain embalmed in the mud for ages without vegetation.



5480. Any rich loamy soil will raise a crop of mustard, and no other preparation is required than that of a good deep ploughing and harrowing sufficient to raise a mould on the surface. The seeds may be sown broad-cast at the rate of one lippie per acre; harrowed in and guarded from birds till it comes up, and hoed and wed before it begins to shoot. In Kent, according to the survey of Boys, white mustard is cultivated for the use of the seedsmen in London. In the tillage for it, the ploughed land is, he says, harrowed over, and then furrows are stricken about eleven or twelve inches apart, sowing the seed in the proportion of two or three gallons per acre in March. The crop is afterwards hoed and kept free from weeds.

5481. Mustard is reaped in the beginning of September, being tied in sheaves, and left three or four days on the stubble. It is then stacked in the field. It is remarked that rain damages it. A good crop is three or four quarters an acre: the price from 7s. to 20s. a bushel. Three or four crops are sometimes taken running, but this must in most cases be bad husbandry.

5482. The use of the white mustard is or should be chiefly for medical and horticultural purposes, though it is often ground into flour, and mixed with the black, which is much stronger, and far more difficult to free from its black husks. The black or common mustard is exclusively used for grinding into flour of mustard, and the black husk is separated by very delicate machinery. The French either do not attempt, or do not succeed in separating the husk, as their mustard when brought to table is always black. It is, however, more pungent than ours, because that quality resides chiefly in the husk. The constituents of mustard seed appear to be chiefly starch, mucus, a bland fixed oil, an acrid volatile oil, and an ammoniacal salt. The fresh powder, Dr. Cullen observes, shews little pungency; but when it has been moistened with vinegar and kept for a day, the essential acrid oil is evolved, and it is then much more acrid.

5483. The leaves of the mustard family, like those of all the radish and brassica tribe, are eaten green by cattle and sheep, and may be used as pot-herbs. The haulm is commonly burned; but is better employed as litter for the straw-yard, or for covering underdrains, if any happen to be forming at the time.

5484. As substitutes for either the black or common mustard, most of the *Cruciferae* enumerated when treating of oil plants (5475.), may be used, especially the *Sinapis arvensis* or charlock, *S. orientalis*, *Chinensis*, and *Brassicata*, the latter commonly cultivated in China. The *Raphanis raphanistrum*, common in corn-fields, and known as the wild mustard, is so complete a substitute, that it is often separated from the refuse corn and sold as Durham mustard seed.

SUBJECT 2. The Canary Grass. — *Phalaris canariensis*, L. *Trian. Dig. L.* and *Gramineae*, J. (fig. 597.)

5485. The canary grass is an annual, with a culm from a foot to eighteen inches in height, and lively green leaves almost half an inch in width. The seeds are thickly

set in a subovate panicle or spike. It is a native of the Canary islands; but now naturalized in several parts of England, and on the continent. It flowers from June to August, and ripens its seeds from September to October. It has long been cultivated in the Isle of Thanet, and a few other places in Kent and Essex: it is there considered an uncertain crop, both on account of the seasons, it being the latest in ripening its seeds of all the grasses, and the fluctuation of prices.

5486. The *culture* of the canary grass consists in pulverizing a loamy soil which is in good heart, or manuring it if worn out; though every judicious farmer tries to avoid giving manure to a corn crop unless after a naked fallow. The seeds are sown in rows at about a foot apart, generally by the ribbing process: the season the month of February, and the quantity of seed four or five gallons per acre. The after-culture consists in repeated hoings and weedings.

5487. The *reaping process* seldom commences before the end of September. The culm being leafy, and the seed difficult to separate from the chaff, it requires to lie in handfuls for a week or more, and to remain more than that time in the field after being tied up in sheaves. In the Isle of Thanet it is cut with a hook, provincially called a *twibil* and a *hink*; by which it is laid in lumps, or wads, of about a sheaf each. The seed clings remarkably to the husk; and, in order to detach it, the crop is left a long time on the ground, to receive moisture sufficient to loosen the enveloping chaff, otherwise it would be hardly possible to thresh out the seed. The wads are turned from time to time, to have the full benefit of the rains and sun.

5488. The *common produce* of canary grass is from thirty to thirty-four bushels per acre; but under the best management in the Isle of Thanet it is often fifty bushels per acre.

5489. The *use* of the seed is chiefly as food for Canary and other cage and aviary birds. The chaff is superior to that of every other culmiferous plant for horsefood, and the straw, though short, is also very nutritive.

SUBJECT. 3. *Buck-wheat*.—*Polygonum fagopyrum*, L. *Octan. Trig. L.*; and *Polygonae*, J. *Blé noir* or *Blé Sarrasin*, Fr. (corrupted from Had-rasin, red corn, Celtic); *Buckweizen*, Ger.; *Trigo negro*, Span.; and *Miglio*, Ital. (fig. 598.)



5490. The *buck-wheat*, or more properly beech-wheat, (from the resemblance of the seeds to beech mast, as its Latin and German names import,) is an annual fibrous-rooted plant, with upright flexuose leafy stems, generally tinged with red, and rising from a foot to eighteen inches in height. The flowers are either white, or tinged with red, and make a handsome appearance in July, and the seeds ripen in August and September. Its native country is unknown; though it is attributed to Asia. It is cultivated in China and other countries of the east as a bread corn, and has been grown from time immemorial in Britain, and most parts of Europe as food for poultry, horses, and also for its meal to be used in domestic purposes. The universality of its culture is evidently owing to the little labor it requires: it will grow on the poorest soil, and produce a crop in the course of three or four months. It was cultivated so early as Gerard's time (1597), to be ploughed in as manure: but at present, from its inferior value as a grain, and its yielding very little haulm for fodder or manure, it is seldom grown but by gentlemen in their plantations to encourage game. Arthur Young, however, "recommends farmers in general to try this crop. Nineteen parishes out of twenty, through the kingdom, know it only by name. It has numerous excellencies, perhaps as many to good farmers, as any other grain or pulse in use. It is of an enriching nature, having the quality of preparing for wheat, or any other crop. One bushel sows an acre of land well, which is but a fourth of the expense of seed-barley. It should not be sown till the end of May. This is important, for it gives time in the spring to kill all the seed-weeds in the ground, and brings no disagreeable necessity from bad weather in March or April, to sow barley, &c. so late as to hazard the crop. It is as valuable as barley, and is the best of all crops for sowing grass-seeds with, giving them the same shelter as barley or oats, without robbing." If all these things were true at the time, they are now only matter of history.

5491. In the *culture* of the *buck-wheat* the soil may be prepared in different ways according to the intention of the future crop; and for this there is time till the end of

May, if seed is the object, and till June if it is to be ploughed in. It will grow on any soil, but only produce a good crop on one that is tolerably rich. It is considered one of the best crops to sow along with grass seed; and yet, (however inconsistent,) the voluminous writer last quoted, endeavours to prove, that buck-wheat, from the closeness of its growth at the top, smotherers and destroy weeds, whilst clover and grass-seeds receive considerable benefit by the shade it affords them from the piercing heat of the sun!!

5492. *The season of sowing* cannot be considered earlier than the last week of April or first of May, as the young plants are very apt to be destroyed by frost. The mode is always broad-cast, and the quantity of seed a bushel per acre; it is harrowed in, and requires no other culture than pulling out the larger weeds, and guarding from birds till the reaping season.

5493. *Buck-wheat* is harvested by mowing in the manner of barley. After it is mown, it must lie several days, till the stalks be withered, before it be housed. It is in no danger of the seeds falling, nor does it suffer much by wet. From its great succulency it is liable to heat, on which account it is better to put it in small stacks of five or six loads each, than in either a large one or a barn.

5494. *The produce of the grain* of this plant may be stated upon the average, at between three and four quarters per acre; it would be considerably more did all the grains ripen together, but that never appears to be the case, as some parts of the same plant will be in flower, whilst others have perfected their seed.

5495. *The use of the grain* of buck-wheat in this country, is almost entirely for feeding poultry, pigeons, and swine. It may also be given to horses, which are said to thrive well on it; but the author of *The New Farmer's Calendar*, says, he thinks he has seen it produce a stupefying effect. It has been used in the distillery in England, and is a good deal used in that way, and also as horse-corn on the continent. Young says, a bushel goes farther than two bushels of oats, and mixed with at least four times as much brap, will be full feed for any horse a week. Four bushels of the meal, put up at four hundred weight, will fatten a hog of sixteen or twenty stone in three weeks, giving him afterwards three bushels of Indian corn or hog-pease, broken in a mill, with plenty of water. Eight bushels of buck-wheat meal will go as far as twelve bushels of barley meal.

5496. *The meal of buck-wheat* is made into thin cakes called crumpits in Italy and even in some parts of England, and it is supposed to be nutritious, and not apt to turn acid upon the stomach. (*Wülhering*.)

5497. *The blossoms* of this plant afford a rich repast to bees, both from the quantity of honey they contain, and from their long duration. On this account it is much prized in France and Germany, and Du Hamel advises bee farmers to carry their hives to fields of this crop in the autumn, as well as to heath lands.

5498. *The haulm* of buck-wheat is said to be more nourishing than clover when cut while in flower. Banister says, it has a peculiar inebriating quality. He has seen hogs which have fed heartily on it, come home in such a state of intoxication as to be unable to walk without reeling. The dried haulm is not eaten readily by any description of animal, and affords but very little manure. On the whole, the crop is of most value when ploughed in green for the latter purpose. As a seed crop, the author of *The New Farmer's Calendar*, seems justified in saying, it is only valuable on land that will grow nothing else. The *Polygonum tartaricum* has been recommended for field culture, but Von Thaer, who tried it repeatedly, found its produce quite insignificant.

SUBJECT. 4. *Of other Plants used in Domestic Economy; which are or may be cultivated in the Fields.*

5499. *Many garden plants* might be cultivated in the fields, especially near large towns where manure is easily procured, and a demand for the produce exists. Among such plants may be mentioned the cress, parsley, onion, leek, lettuce, radish, &c. There are also some plants which enter into the agriculture of foreign countries where the climate is not dissimilar to our own, which might be very effectually cultivated in this country were it desirable. Among these are the tobacco and the chicory, the latter for its roots as a substitute for coffee. The lettuce might be grown for its milky juice, as a substitute for, or rather a variety of opium. Of dwarf fruits, as the strawberry, currant, gooseberry, raspberry, &c. we add nothing here, having already alluded to them in treating of orchards.

5500. The agriculturist who attempts to grow any of the above plants, can hardly expect to succeed unless his knowledge extends beyond the mere routine of country husbandry, either by reading and the study of the nature of vegetables, or by some experience in the practice of gardening. No farmer on a moderately extensive scale will find it worth while to attempt such productions, whatever may be his knowledge or resources; and for the garden-farmer, or the curious or speculative amateur, we would recommend observation and enquiry round the metropolis, and the reading of books on horticulture. All that we shall do here, will be to give some indications of the culture and management of cress, chicory, and tobacco.

5501. *The garden cress* (*Lepidium sativum*, L.), too well known to require any description, is grown in the fields in Essex, the seed being in some demand in the London market.

It is sown on any sort of soil, but strong loam is the most productive. After being well pulverised on the surface, the seed is sown broad-cast and lightly harrowed in. The season of sowing for the largest produce is March, but it will ripen if sown the first week in May. The quantity of seed to an acre varies from two to four pecks, according to the richness of the land; the seed will not grow the second year. No after-culture is required but weeding. The crop is reaped and left in handfuls to dry for a few days, and then threshed out like rapeseed or mustard in the field.

5502. The use of the cress seed is chiefly for sowing to cut for young turkeys; and for forcing salads by the London cooks on hot moist flannels and porous earthenware vessels. A very considerable quantity is also used in horticulture, it being one of the chief early salads, and cut when in the seed leaf. The haulm is of very little use as litter, and on the whole, the crop is exhausting.

5503. The culture of the chicory as an herbage plant has already been given (5074.); when grown for the root to be used as a substitute for coffee, it may be sown on the same soil as the carrot, and thinned out to the same distance as that plant. These roots are taken up in the first autumn after sowing in the same manner as those of the carrot. When they are to be manufactured on a large scale, they are partially dried, and in that state sold to the manufacturers of the article, who wash them, cut them in pieces, roast them on a kiln, and grind them between fluted rollers into a powder, which is packed up in papers, containing from two ounces to three or four pounds. In that state it is sold either as a substitute for coffee, or for mixing with it. But when a private family cultivate this plant for home manufacture, the roots are laid in a cellar among sand, and a few taken out as wanted, washed, cut into slices, roasted in the coffee roaster till they become of a brown color, and then passed as wanted through the coffee mill.

5504. The value of the chicory as a coffee plant, Von Thaer observes in 1810, is proved by its having been cultivated for that purpose for thirty years. Dr. Howison has written some curious papers on the subject in *The Caledonian Horticultural Memoirs*, (vol. iv.), and both that gentleman and Dr. Duncan approve of its dietic qualities. The former indeed says, he thinks it preferable to coffee, which may be a matter of taste, as some prefer the flavor of the powdered roots of dandelion to that of either coffee or chicory. Dr. Duncan is of opinion that chicory might be cultivated with great national advantages as a substitute for the exotic berry. (*Disco. to Caled. Hort. Soc.* 1820.)

5505. Of the tobacco, there are two species which may be cultivated in this country: the Nicotiana tabacum, or Virginia tobacco, which is almost the only sort imported, and the N. rustica, common tobacco, the Bauern tabac of Germany, and cultivated in that country, Sweden, and many parts of France, Switzerland, Holland, &c., both for private use and manufacture for public sale. Almost every one who occupies a cottage and garden in these countries grows as much as supplies their pipes; but it is rarely made into snuff or chewing tobacco by private families. The culture of tobacco is prohibited in Britain for political reasons; but before that law was given, it was grown and cured in a very sufficient manner by farmers both in England and Scotland. At present every family may grow a sufficient quantity for their own use.

5506. The soil for tobacco must be deep, loamy, and rich; well pulverised before planting, and frequently stirred and kept free from weeds during the growth of the plants. The plants in this country should be raised in a warm part of the garden: the seed is very small, and should be sown and lightly covered, and then the surface pressed down with the back of the spade in the middle of March. In May they will be fit to transplant, and should be placed in lines three feet apart every way. If no rain fall, they should be watered two or three times. Every morning and evening the plants must be looked over, in order to destroy a worm which sometimes invades the bud. When they are about four or five inches high, they are to be cleared from weeds and moulded up. As soon as they have eight or nine leaves; and are ready to put forth a stalk, the top is nipped off, in order to make the leaves longer and thicker. After this the buds which sprout at the joints of the leaves are all plucked, and not a day is suffered to pass without examining the leaves, to destroy a large caterpillar, which is sometimes very destructive to them.

5507. The following is the mode of taking and fermenting the leaves in America. When they are fit for cutting, which is known by the brittleness of the leaves, they are cut with a knife close to the ground; and after lying some time, are carried to the drying shed or house, where the plants are hung up by pairs, upon lines, leaving a space between, that they may not touch one another. In this state they remain to sweat and dry. When perfectly dry, the leaves are stripped from the stalks, and made into small bundles, tied with one of the leaves. These bundles are laid in heaps, and covered with blankets. Care is taken not to overheat them, for which reason the heaps are laid open to the air from time to time, and spread abroad. This operation is repeated till no more heat is perceived in the heaps, and the tobacco is then stored in casks for exportation.

5508. To sow seed allow one or two of the best plants to run, they will flower and be very ornamental in June, July, and August, and ripen their seeds in September and October.

5509. In the manufacture of tobacco, the leaves are first cleaned of any earth, dirt, or decayed parts; next they are gently moistened with salt and water, or water in which some other salt, and sometimes other ingredients have been dissolved, according to the taste of the fabricator. This liquor is called tobacco sauce. The next operation is to remove the midrib of the leaf, then the leaves are mixed together to render the quality of whatever may be the final manufacture or application equal; next they are cut into pieces with a fixed knife, and crisped or curled before a fire; the succeeding operation is to spin them into cords, or twist them into rolls by winding them with a kind of mill round a stick. These operations are performed by the grower, and in this state (of rolls) the article is sent from America to other countries, where the tobaccoists cut it into chaff like shreds by a machine like a straw-cutter, for smoking; form it into small cords for chewing; or dry and grind it for snuff. In manufacturing snuff various matters are added to give it an agreeable scent; and hence the numerous varieties of snuff. The three principal kinds are called rappes, Scotch or Spanish, and thirds. The first is only granulated; the second is reduced to a very fine powder; and the third is the siftings of the second sort. In a former section (5439.) we have hinted that no farmer who cultivates the hop need be without a vegetable equal to asparagus, or fibre similar to that of flax to employ his servants in spinning; and from the foregoing observations it would seem that whoever has a garden may grow his own coffee and tobacco.

SECT. V. *Of Plants which are or may be grown in the Fields for Medicinal Purposes.*

5510. A number of medical plants were formerly grown in the fields; but vegetable drugs are now much less the fashion; a few powerful sorts are retained, which are either collected wild or are natives of other countries, and the rest of the pharmacopœia is chiefly made up of minerals. It may safely be affirmed that there are no plants belonging to this section which deserve the notice of the general farmer; but we have thought it desirable to notice a few sometimes grown by farming gardeners, and which may be considered as belonging almost equally to horticulture and agriculture, or as points of connection between the two arts. These are the saffron, liquorice, rhubarb, lavender, mints, chamomile, and thyme.

5511. *The saffron or autumn crocus* (*Crocus sativus*, L. fig. 599 a.), is a bulbous-rooted

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perennial, which has been long cultivated in the south of Europe, and since Edward III.'s time in England, and chiefly at Saffron Walden in Essex. It was abundantly cultivated there, and in Cambridgeshire, Suffolk, and Herefordshire, in the beginning of the seventeenth century, but the quantity of land under this crop has been gradually lessening for the last century, and especially within the last fifty years, so that its culture is now almost entirely confined to a few parishes round Saffron Walden. (*Young's Essex.*) This is owing partly to the material being less in use than formerly, and partly to the large importations from the East, often, as Professor Martyn observes, adulterated with bastard saffron (*Carthamus tinctorius*) and marygolds (*Calendula officinalis*).

5512. The bulbs of the saffron are planted on a prepared soil not poor nor a very stiff clay, but if possible a hazel mould on chalk. The bulbs are planted in July, in rows six inches apart across the ridges, and at three inches distance in the rows.

5513. The flowers, which are purple and appear in September, are gathered, carried home, and the stigmas picked out, together with a portion of the style; these are dried on a kiln between layers of paper, and under the pressure of a thick board to form the mass into cakes.

5514. Two pounds of dried oak is the average crop of an acre after first planting, and twenty-four pounds for the two next years. After the third crop the roots are taken up, divided, and re-planted.

5515. *The uses of saffron* in medicine, domestic economy, and the arts, are various. It is detensive, resolvent, anodyne, cephalic, ophthalmic, &c.; but its use is not without danger: in large doses it promotes drowsiness, lethargy, vomiting, and delirium; even its smell is injurious, and has been known to produce syncope. It is used in sauces by the Spaniards and Poles; here and in France it enters into creams, biscuits, conserves, liquors, &c. and is used for coloring butter and cheese, and also by painters and dyers.

5516. *The liquorice* (*Glycyrrhiza glabra*, L. fig. 599 b.) is a deep-rooting perennial, of the leguminosæ, with herbaceous stems rising four or five feet high. It has long been much cultivated in Spain; and since Elizabeth's time has been grown in different parts of England.

5517. *The soil* for the liquorice should be a deep sandy loam, trenched by the spade or plough, or the aid of both, to two and a half or three feet in depth, and manured if necessary. The plants are procured from old plantations, and consist of the side roots, which have eyes or buds. These may be taken off, either in autumn when a crop of liquorice is taken up for use, and laid in earth till spring, or taken from a growing plantation, as wanted for planting. The planting season may be either October, or February and March. In general the latter is preferred. The plants are dibbled in in rows three feet apart, and from eighteen inches to two feet in the row, according to the richness of the soil. The after-culture consists in hoeing and deep stirring, in weeding, and in cutting over and carrying away the haulm every autumn after it is completely withered. As the plants do not rise above a foot the first season, a crop of onions or beans is sometimes taken in the intervals. The plants must have three summers' growth, at the end of which the roots may be taken up by trenching over the ground. The roots are either immediately sold to the brewers' druggists, or to common druggists, or preserved, like carrots or potatoes, in sand, till wanted for use. They are used in medicine and porter-brewing.

5518. *The rhubarb* (*Rheum palmatum*, L. fig. 599 c.) is a perennial, with thick oval roots, which strike deep into the ground, large palmate leaves, and flower-stems six or eight feet high. The Society of Arts exerted themselves for many years to promote the culture of this plant, as did Dr. Hope, of Edinburgh. It has accordingly

been cultivated with success both in England and Scotland; though the quality of the root produced is considered by the faculty as inferior to that of the Russia or Turkey rhubarb, probably, as Professor Martyn thinks, owing to the moisture of our climate, and the imperfect mode in which it has been dried.

5519. *In the culture of this plant*, if bulk of produce be the object, then a deep, rich, loamy sand, should be chosen; but if flavor, then a dry, warm, somewhat calcareous sand. Prepare, as for liquorice, and sow the seeds in patches of two or three seeds, in rows four feet apart, and the same distance in the rows. Transplanting from seed-beds may be adopted; but the roots are never so handsome and entire. As soon as the plants appear, leave only one in a place. The plants will now stand in the angles of squares of four feet to the side; and the after-culture consists in horse-hoeing and deep stirring, both lengthways and across; in ploughing in the same directions; in never letting the flower-stems rise higher than two feet, or shew flowers or seed, unless some is wanted for propagation; and in removing the decayed haulm every autumn. The plants having stood three or four summers, may be taken up, and their main roots dried in a very slow manner by any of the following modes:—The common British mode of curing or drying the rhubarb, after cleaning the roots, is to cut them into sections, an inch or more in thickness, string them and dry them in airy lofts, laundries, or kitchens, in a gradual manner. This has long been the practice of private gardeners who grow the root for their own use, and has also been adopted by cultivators for the druggists. The rhubarb is cured in Tartary by being thoroughly cleaned, the smaller branches cut off, and then cut transversely into pieces of a moderate size; these are placed on long tables or boards, and turned three or four times a day, that the yellow viscid juice may incorporate with the substance of the root. If this juice be suffered to run out, the roots become light and unserviceable; and if they be not cut within five or six days after they are dug up, they become soft and decay very speedily. Four or five days after they are cut, holes are made through them, and they are hung up to dry exposed to the air and wind, but sheltered from the sun. Thus, in about two months, the roots are completely dried, and arrive at their full perfection. The loss of weight in drying is very considerable; seven loads of green roots yielding only one small horse-load of perfectly dry rhubarb.

5520. *The Chinese in curing rhubarb*, after having cleaned the roots, by scraping off the outer bark, as well as the thin yellow membrane underneath, cut them in slices, an inch or two in thickness, and dry them on stone slabs, under which large fires are kindled. They keep continually turning these slices on the warm slabs; but as this operation is not sufficient to dry them thoroughly, they make a hole through them, and suspend them on lines, in a place exposed to the greatest heat of the sun, till they are in a condition to be preserved without danger of spoiling. A copious account of all the experiments made in Britain for the culture and curing of the rhubarb up to 1805, is given by Professor Martyn, in his edition of *Müller's Dictionary*, art. *Rheum*; and of the Turkey, Russian, and Chinese rhubarb, in *Thomson's Dispensatory*, 2d edit. 1822, p. 469.

5521. *The lavender* (*Lavandula spica*, L. fig. 599 d) is a dwarf odoriferous shrub of three or four years' duration, grown in the fields in a few places round London, and chiefly in Surrey, for the spikes of flowers used by the druggists, perfumers, and distillers. The soil should be a poor dry calcareous gravel; the seeds being sown in a garden in spring, may be transplanted in September or March following, in rows two feet apart and kept free of weeds. The second season they will yield a few flowers, and a full crop the fourth, after which the plants will continue productive for five or six years. The spikes are gathered in June, dried in the shade, and sold in bundles to the herbalists, druggists, &c.

5522. *Thyme, wormwood, marjoram, savory*, and some other aromatics, are cultivated in the same manner, and for similar purposes. Being usually smaller plants, they should be planted closer, but to have much flavor the soil must be dry and calcareous.

5523. *Chamomile* (*Anthemis nobilis*) is a creeping perennial, grown for its flowers. It only requires to be planted on a poor soil, in rows a foot apart and hoed between. It will produce abundance of flowers annually from June to September, which are gathered, and dried in the shade. They are sold by weight to the druggists and apothecaries. The double-flowered variety is, from its beauty, that commonly cultivated; but the single possesses more of the virtues of the plant according to its weight.

5524. *The mints* (*Mentha*), and especially the *peppermint* (*Mentha piperitis*), are creeping rooted perennials, cultivated on rich marshy or soft black moist soils for distilling. The plants are grown in beds with trenches of a foot or more in width and depth between, so as to admit of irrigation. The sets are obtained from old plantations, and planted in rows across the beds at six inches distance every way, in March or April. No produce is obtained the first year worth notice, but a full crop the third, and the shoots will continue to produce five or six years. The spikes of flowers, and in some cases the entire herbage, is cut over in June as soon as the flowers expand, and carried immediately to the druggist's still. Some growers distil it themselves.

5525. *The common valerian* (*Valeriana officinalis*, L.) is sometimes cultivated for its roots for the druggists. It is a native plant, and prefers a loamy soil. In Derbyshire it is planted in rows twelve inches apart, and the plants six inches asunder, which are either procured from the offsets of former plantations, or from wild plants found in wet places in the neighboring woods. Soon after it comes up in the spring the tops are cut off, to prevent its running to seed, which spoils it. At Michaelmas, the leaves are pulled and given to cattle, and the roots dug up carefully, and clean washed, and the remaining top is then cut close off, and the thickest part slit down to facilitate their drying, which is effected on a kiln, after which they must be packed tight, and kept very dry, or they spoil. The usual produce is about 18 cwt. per acre. This crop is manured in the winter, of which it requires a great deal.

5526. *The orchis or salep plant* (*Orchis mascula*, L.) is a tuberous perennial, which grows plentifully in moist meadows in Gloucestershire, and other parts of the country. It flowers in May and ripens seeds in July. It has been proposed to be cultivated for

its tubers to be used as salep; but the plant is very difficult of propagation from seed, and can hardly be multiplied at all by the root, and though it may answer to collect the tubers and prepare them, it is not likely it ever will to attempt their culture. As the plant is very abundant in some situations, it may be useful to know its preparation, which is thus described in *Phil. Trans.* vol. lix.

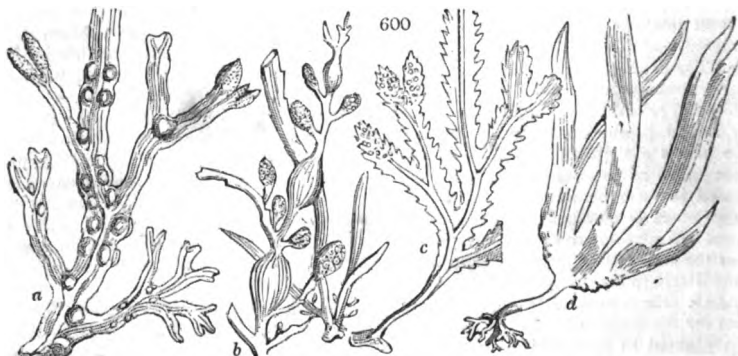
5597. *The bulb is to be washed in water, and the fine brown skin which covers it, is to be separated by means of a small brush, or by dipping the root in hot water, and rubbing it with a coarse linen cloth. When a sufficient number of bulbs is thus cleansed, they are to be spread on a tin plate, and placed in an oven heated to the usual degree, where they are to remain six or ten minutes, in which time they will have lost their milky whiteness, and acquired a transparency like horn, without any diminution of bulk. Being arrived at this state, they are to be removed, in order to dry and harden in the air, which will require several days to effect, or by using a gentle heat, they may be finished in a few hours. By another process, the bulb is boiled in water, freed from the skin, and afterwards suspended in the air to dry; it thus gains the same appearance as the foreign salep, and does not grow moist or mouldy in wet weather, which those that have been barely dried by heat are liable to. Reduced into powder, they soften and dissolve in boiling water into a kind of mucilage, which may be diluted for use with a large quantity of water or milk. Thus prepared, they possess very nutritious virtues; and if not the very same species as is brought from Turkey and used for making salep, so nearly resembles it as to be little inferior. In Turkey the different species of the orchis are said to be taken indifferently; but in England, the orchis mascula is the most common. (Gloucestershire Report, 377.)*

CHAP. IX.

Of Marine Plants used in Agriculture.

5528. *All marine plants may be used as manure with great advantage, either in a recent state or mixed with earth. But the most valuable vegetables which grow in or near salt water, are those from which kelp or soda may be manufactured. The use of sea-weed, as an article from which kelp might be manufactured, seems to have been practically recognised in Scotland about the beginning of the eighteenth century. The great demand for kelp in the manufacture of glass and soap at Newcastle, and of alum at Whitby, seems to have introduced the making of this commodity upon the shores of the Forth, so early as about the year 1720. It began to be manufactured in the Orkney Islands in the year 1723, but in the western shires of Scotland, the making of kelp was not known for many years after this date. The great progress of the bleaching of linen cloth in Ireland, first gave rise to the manufacture of kelp in that kingdom; and from Ireland it was transferred to the Hebrides about the middle of the eighteenth century. On the shores of England the kelp plants are not abundant.*

5529. *Of the different marine plants which are employed for the manufacture of kelp, the Fucus vesiculosus (fig. 600 a), is considered by kelp makers as the most productive; and the kelp obtained is, in general, supposed to be of the best quality.*



5530. *The fucus nodosus (b), is considered to afford a kelp of equal value to that of the above species, though perhaps it is not quite so productive.*

5531. *The fucus serratus (c) or black weed, as it is commonly called, is neither so productive, nor is the kelp procured from it so valuable as that obtained from the other two. This weed is seldom employed alone for the manufacture of kelp; it is in general mixed with some of the other kinds.*

5532. *The fucus digitatus (d), is said to afford a kelp inferior in quality to any of the others; it forms the principal part of the drift-weed.*

5533. *The plants are cut in May, June, and July, and exposed to the air on the ground, till they be nearly dried, care being taken to prevent them, as much as possible, from being exposed to the rain. They are then burned, either in a pit dug in the sand or on the surface of the ground, surrounded by loose stones, forming in both ways a rude sort of kiln. A peat fire is kindled on the ground, and the weed gradually added, till the*

fire extends over the whole floor of the kiln; the weed is then spread lightly on the top, and added in successive portions. As it burns it leaves ashes, which accumulating towards evening, become semifused, and are then well stirred. Another day's burning increases the mass; and this is continued till the kiln is nearly filled. On some occasions the kiln consists of a cavity in the ground, over which bars of iron are placed; and on this the ware is burned, the ashes falling into the cavity, where they are well worked by the proper instruments.

5534. *Kelp is generally divided into two kinds; the cut-weed kelp, and the drift-weed kelp; the former made from the weed which has been recently cut from the rocks, the latter from that which has been drifted ashore. The latter is supposed to yield a kelp of inferior quality. Some specimens of kelp, however, made from sea-weed which had been drifted ashore, tend to prove that this is not always the case. Weed which has been exposed to rain during the process of drying, affords a kelp of inferior quality. It is of the utmost importance to the manufacturer of kelp, to keep his weed as much as possible free from rain. For this purpose many employ sheds; when these are not at hand, the weed which has been laid out to dry, should be collected into one heap during the rain; when this ceases, it should again be immediately spread out. It has often been matter of dispute, how old the plants should be before they be cut. In general, three years is the time allotted. This, however, from some trials which have been made to ascertain this point, seems to be too long. From experiments, it appears, that the produce of kelp, from one ton of three years old weed, is only eight pounds more than that from the same quantity of two years old; from this we would conclude, that the weed ought to be cut every two years. Though perhaps less weed may be procured from the same extent of ground occupied by weed of two, than of three year's growth, yet the difference may not be so great as to render it worth while to allow the weed to remain for three years.*

5535. *In order to increase the quantity of kelp, it has been suggested to the Highland Society, that the seed of the salsola soda might be imported and cultivated at a small distance from the shore, with the design of mixing the plant with the sea-ware, for the improvement of the kelp. It was formerly imagined, that the barilla plant would not produce any quantity of alkali, worth its cultivation, if planted in France; but in the year 1782, some spirited individuals procured a quantity of barilla seed, and made a plantation of it near the coast of the Mediterranean, in the province of Languedoc, and had the satisfaction for several years, to find, that the barilla which they produced from these plants, was of a quality equal to that which they usually procured from Alicante. Why, then, may not a similar attempt in our own country be equally successful?*

5536. *Other plants. If the growers of kelp could contrive to make some considerable plantations of the most productive of the kali, or of fumitory, wormwood, and other inland plants, which yield large quantities of potash, and collect the crop to burn with the other materials, the carbonate of potash resulting from their incineration would decompose the sea salt, and a great accumulation of carbonate of soda would be produced. It was proved long ago by Du Hamel, that the marine plants produced soda merely in consequence of their situation, for, when they have been cultivated for some years in an inland spot, they yield only potash.*

5537. *There are immense tracts of shore on the mainland and islands of Scotland which may be easily cultivated for the production of kelp, from which at present not one penny is derived. All the cultivation requisite is, to place whin or other hard stones, not under the size of the crown of a hat, upon such vacant spaces. Contracts have been made to plant shore lands in the Highlands with such stones, at the rate of 20*l.* per Scots acre. Such stones are generally to be found at high-water mark, on all the shores of the lochs of the Highlands. They are put into a boat at high water, then carried to the ground to be planted, and thrown overboard, and on the ebb of the tide they are distributed regularly over the shore, preserving a clear space round every stone of one foot, which distance, after very minute examination, appears to be the most eligible for producing the greatest crop of ware. It is evident these stones should be of a round shape, the more surface being exposed to the alternate action of the air and water, so much more kelp-ware will be produced from a given space of ground. In four years the first crop may be cut, which, on the above data, will yield about four per cent. on the original expense. But the crop may be manufactured into kelp in every third year thereafter, which, on the same data, is equal to about five per cent. In this improvement there is no hazard of bad crops, and if the manufacture is begun early enough in the season, there is little danger to be apprehended from bad weather, it being understood that the operation of kelp-making can be carried on, should there be no more than two dry days in eight. (*Highland Society's Trans.* vol. viii.)*

CHAP. X.

Of Weeds or Plants which are injurious to those cultivated in Agriculture.

5538. *Every plant which appears where it is not wanted may be considered injurious, though some are much more so than others. A stalk of barley in a field of oats is a weed, relatively to the latter crop, but a thistle is a weed in any crop; weeds, therefore, may be classed as relative and absolute.*

5539. *Relative weeds*, or such cultivated plants as spring up where they are not wanted, give comparatively little trouble in extirpating them. The most numerous are the grasses when they spring up in fields of saintfoin or lucern, or among corn crops in newly broken up grass lands. The roots of chicory, in fields that have been broken up after bearing that crop for some years, of madder, liquorice, &c. are also of difficult extirpation. When the potatoe crop has not been carefully gathered, or mustard has been allowed to shed its seed, they also occasion trouble. Other similar cases will readily occur to the practical man, and need not be mentioned.

5540. *Absolute weeds*, or such native plants as are considered injurious to all crops, are very numerous, and may be variously arranged. Some affect in a more peculiar manner corn-fields and tillage lands, and these are chiefly annuals, as wild mustard, wild radish, poppy, blue bottle, cockle, darnel, &c. ; or biennials, as the thistle ; or perennials, as couch-grass, knot-grass, black couch, polygonum, &c. ; on lands laid down to grass for a few years, dock, ox-eye daisy, ragweed, &c. Others infest grass lands, and these are chiefly perennials, such as crowfoot, one of the most difficult of weeds to extirpate ; thistles, docks, rushes, sedges, moos, and an endless variety of others. Some are more particularly abundant in hedges, of which the reedy and coarse grasses, as couch-grass, brome-grass, and the climbing and twining plants, as goose grass (*Galium aparine*), and the twiners, as bindweed (*Convolvulus*), are the most injurious.

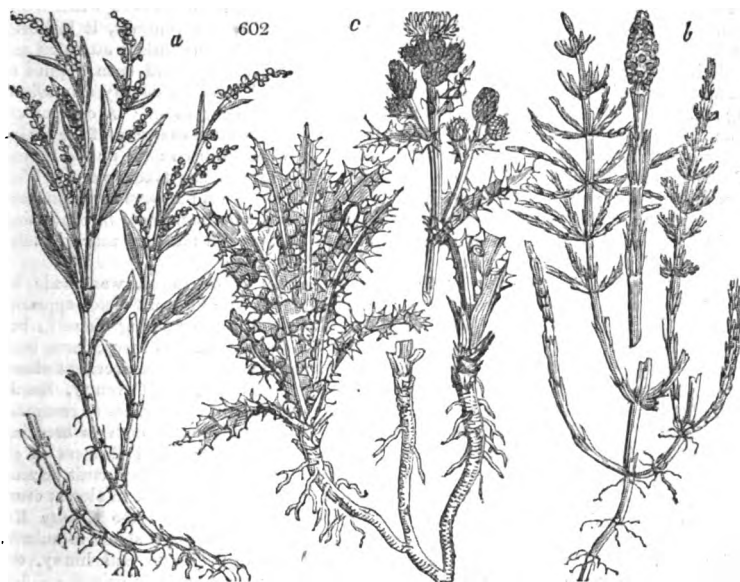
5541. With regard to the destruction of weeds, they may be classed first, according to their duration. All annuals and biennials, as sandwort (fig. 601 b), and sorrel (c), are effectually destroyed by cutting over the plant at any point below that whence the seed leaves originated, as this prevents them from ever springing again from the roots. Perennials of the fibrous-rooted kind may be destroyed in the same manner, as the crowfoot, ragweed, the fibrous-rooted grasses, and many others. Some fusiform rooted perennials may also be destroyed by similar means ; but almost all the thick rooted perennials require to be wholly eradicated.

5542. *The perennial weeds which require their roots to be wholly eradicated*, may be classed according to the kind of roots. The first we shall mention are the stoloniferous roots or surface shoots of plants, by which they propagate themselves. Of this kind is the creeping crowfoot, goosefoot or wild tansey, and other potentillas, mints, strawberries, black couch-grass, and most of the agrostidæ and other grasses.

The next are the under-ground creeping roots, as the couch-grass, convolvulus arvensis, and other species, of bind-weed, coltsfoot (fig. 601 a) sowthistle, several tetradynamous plants, as todflax, scrophularia, nettle, hedge-nettle, (*Stachys*), lamium, ballota, &c. Some of these, as the bindweed and corn-mint, are extremely difficult to eradicate : a single inch of stolone, if left in the ground, sending up a shoot and becoming a plant. The creeping and descending vivacious roots are the most difficult of all to eradicate. Of this class are the polygonum amphibium, (fig. 602 a), the reed (*Arundo phragmites*), the horse-tail (*Equisetum*, fig. 602 b), and some others. These plants abound in deep clays, which have been deposited by water, as in the carse and clay-vales of Scotland. In the carse of Falkirk for example, the roots of the polygonum amphibium are found every where in the subsoil alive and vigorous. They send up a few leaves every year in the furrows and on the sides of drains, and when any field is neglected or left a year or two in grass, they are found all over its surface. Were this tract to be left to nature for a few years, it would soon be as completely covered with the polygonum as it must have been at a former age, when it was one entire marsh partially covered by the Firth of Forth. The horse-tail is equally abundant in many soils, even of a drier description ; and the corn thistle, (*Serratula arvensis*, fig. 601 e) even in dry rocky grounds. Lightfoot (*Flora Scotica*) mentions plants of this species dug out of a quarry, the roots of which were nineteen feet in length. It would be useless to attempt eradicating the roots of such plants. The only means of keeping them under, is to cut off their tops or shoots as soon as they appear ; for which purpose, lands subject to them are best kept in tillage. In grass lands, though they may be kept from rising high, yet they will, after being repeatedly mown, form a stool or stock of leaves on the surface, which will suffice to strengthen their roots, and greatly to injure the useful herbage plants and grasses.



5543. *Tuberous and bulbous rooted weeds*, are not very numerous; wild garlic, arum, and bryony, are examples, and these are only to be destroyed by complete eradication.



5544. *Ramose, fusiform, and such like rooted perennials*, of which rest-harrow, fern, and scabious are examples, may in general be destroyed by cutting over below the collar or point where the seed-leaves have issued. Below that point the great majority of plants, ligneous as well as herbaceous, have no power of sending up shoots; though there are many exceptions, such as the dock, burdock, &c. among herbs, and the thorn, elm, poplar, cherry, crab, &c. among trees.

5545. *A catalogue of weeds* could be of little use to the agriculturist, as the mere names could never instruct him as to their qualities as weeds, even if he knew them by their proper names. Besides, weeds which abound most, and are most injurious in one district, are often rare in another. Thus, the poppy abounds in gravelly districts, the charlocks on clays, the chickweed, groundsoil, nettle, &c. only on rich soils. A local flora, or any of the national floras, as Lightfoot's *Flora Scotica*, and Smith's *British Flora*, by pointing out the native habits of indigenous plants, may be of considerable use to the agriculturist who has acquired a slight degree of the science of botany, so as to enable him to refer any plant which he may pick up in flower, not knowing the name, to its place in the arrangement of the book.

BOOK VII.

THE ECONOMY OF LIVE STOCK AND THE DAIRY.

5546. *The grand characteristic of modern British farming*, and that which constitutes its greatest excellence, is the union of the cultivation of live stock with that of vegetables. Formerly in this country, and in most other countries, the growing of corn and the rearing of cattle and sheep constituted two distinct branches of farming; and it was a question among writers, as Von Thaer informs us it still is in Germany, which were the most desirable branches to follow. The culture of roots and herbage crops at last led gradually to the soiling or stall feeding husbandry, in imitation of the Flemings; and afterwards, about the middle of the last century, to the alternate husbandry, which is entirely of British invention, and has been the means of improving the agriculture of the districts where it is practised, more effectually than any thing else. It is observed

by Brown, that "though horses, neat cattle, sheep, and swine are of equal importance to the British farmer with corn crops, yet we have few treatises concerning the animals, compared with the immense number that have been written on the management of arable land, or the crops produced upon it. But though so little has been written, the improvement of those animals has not been neglected; on the contrary, it has been studied like a science, and carried into execution with the most sedulous attention and dexterity. We wish it could be stated, that one half of the care had been applied to the selecting and breeding of wheat and other grains, which has been displayed in selecting and breeding the best proportioned and most kindly feeding sheep. A comparison cannot, however, be made with the slightest degree of success; the exertions of the sheep-farmers having, in every point of view, far exceeded what has been done by the renters of arable land. Even with cattle considerable improvement has taken place. With horses, those of the racing and hunting kinds excepted, there has not been correspondent improvement; and as to swine, an animal of great benefit to the farmer, in consuming offal which would otherwise be of no value, it is to be regretted that very much remains to be done."

5547. *The first important effort in the improvement of live stock, was made by Robert Bakewell, of Dishly, about 1780; and the first scientific work which appeared on the subject, was by George Cully, in 1782. Bakewell wrote nothing himself; but the principles on which he acted in selecting and breeding cattle and sheep, have been developed, by his contemporaries, in various agricultural reports. Some excellent observations on the subject have also appeared from the pens of Cline, Dr. Coventry, Sir. J. Sebright, Hunt of Leicester, and others. The improvement in the sciences of comparative anatomy and physiology has also led to an amended practice both in breeding and in pathology. The example of various opulent proprietors and farmers in all parts of the empire, tended to spread this improvement, by which the pursuit became fashionable. Add to these the accounts of the management of live stock in almost every county of the British Isles, as contained in Marshall's Works and the County Reports. From these sources we shall draw the information we are about to submit, and shall adopt the arrangement of the horse, the ass, the mule and hinny, the bull family and the dairy, the sheep, the swine, minor stock, and injurious animals or vermin.*

CHAP. I.

The cultivated Horse.—*Equus Caballus*, L.; *Mammalia Bellua*, L.; and *Pachydermes Solipedes*, Cuvier; *Cheval*, Fr.; *Pferde*, Ger.; *Caballo*, Span.; and *Cavallo*, Ital.

5548. *The horse family*, by far the most important among the brute creation as a servant to man, includes several species both in a wild and cultivated state, as the *Equus hemionus* or wild mule, a native of Arabia and China, and which it is supposed would form an excellent race of small horses, could they be reduced to a state of domestication; the *E. asinus*, or ass, well known; the *E. zebra*, or striped ass; the *E. quagga*, by some considered a variety of the zebra; and the *E. bialucis* or cloven-footed horse, a native of Chili, and by many supposed to belong to a distinct genus.

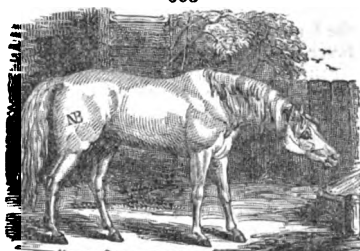
5549. *The common horse, justly considered as the noblest of animals*, is found in a wild state in the deserts of Great Tartary, in the southern parts of Siberia, and in other parts of Asia, and in the interior of Africa. He is of the greatest antiquity, and has long been domesticated and cultivated in most parts of the earth, for the various purposes of war, hunting, parade, the saddle, or draught; and in some places, partly for his flesh and the milk of the female. The parts of a horse, when no longer endowed with life, are applied to various useful purposes: the blood for manure; the bones are broken and boiled, to produce oil, and afterwards are ground into an excellent manure; some of the bones are also used in the mechanical arts. The flesh supplies food for the domestic carnivorous animals, the cat and dog; for carnivorous birds, as the hawk, eagle, &c., kept for amusement or curiosity; and for fish and various similar purposes. We shall consider the horse, in regard to its varieties, organology, anatomy, physiology, diseases, breeding, rearing, training, feeding, and working.

SECT. I. *Of the Varieties of the Horse.*

5550. *The varieties of the domestic horse vary exceedingly in different countries. The Arabian horse (fig. 603.) is a portrait of one brought by Buonaparte from*

Egypt, and now living in the royal garden of Paris,) are reckoned the best, and their inhabitants the most expert in horsemanship. The care taken by the Arabs in preserving the breeds of their horses, is most remarkable. None but stallions of the finest form and purest blood are allowed access to their mares, which is never permitted but in the presence of a professional witness or public officer, who attests the fact, records the name, and signs the pedigree of each. The Persian horses are considered next in value; and after them the horses of Andalusia in Spain. The Barbary horses are descended from the Arabians, and much esteemed. Jackson (*Empire of Morocco*, p. 42.) mentions one very fleet variety, used for hunting the ostrich, and fed entirely on camel's milk.

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In Algiers they are said not to like to castrate their horses, but only squeeze their testicles when they are about three months old, which renders them incapable of propagation. The horses of India are small and vicious, the climate being unfavorable to their greater development. Those of Tartary are of a moderate size; but strong, muscular, full of spirit and active. The Tartars are considered skilful riders. Like the Kalmucks, they eat their flesh as we do that of oxen, and use their milk either in curd or fermented.

5551. *Of the European varieties of the horse*, those of Italy were formerly in greater esteem than at present; but still, those of the Neapolitans shine both under the saddle and in traces. Great numbers are bred in Sicily; those of Sardinia and Corsica are small, but active and spirited. The Swiss horses partake of the same qualities.

5552. *The Spanish horses* are much commended: some make them second to the Arabians, and place them before the Barb. Those of the finest breeds are generally finely carcassed and well limbed horses, active, ready and easy in their paces, docile and affectionate to their owners, full of spirit and courage, but tempered with mildness and good nature; they are for the most part, of a moderate size. Those which are bred in Upper Andalusia are deemed the most valuable. The Portuguese horses, or rather mares, were famous of old for being very fleet and long-winded; but of late it is said they are much degenerated.

5553. *France* abounds in horses of all kinds, but does not excel in native breeds; the best of those fit for the saddle come from Limousin: they resemble the Barbs in many particulars, and like them are fittest for hunting, but they are supposed not to be fit for work before they are seven or eight years old. There are also very good "Bidets" or ponies, in Auvergne, Poitou, and Burgundy. Next to those of Limousin, Normandy claims precedence, for a well formed and useful breed. Lower Normandy and the district of Cotentin furnish some very tolerable coach horses, and which are more active and appear more elastic in their motions than the Dutch horses. They have, however, a noble race of large draught horses equal to any seen in England, and, among which, the chestnut color seems to prevail. The French horses generally are apt to have their shoulders although oblique, yet too loose and open, as those of the Barbs are usually too confined and narrow.

5554. *The Flemish horses* are inferior in value to the Dutch, having usually large heavy heads and necks; their feet also are immoderately large and flat, and their legs subject to watery humours and swellings.

5555. *Holland* furnishes a race of horses which are principally serviceable in light draught work; the best come from Friesland.

5556. *Germany* is not destitute of good horses, and such as prove useful for many purposes; but they are reckoned to be heavy and defective in wind. The Germans possess, however, finer breeds obtained from Turks and Barbs which are kept as stallions; they obtain also some good specimens from the Italians and Spaniards. As racers and hunters they are inferior to the Hungarian and Transylvanian horses. The horses of Bohemia are not distinguished by any eminent qualities. The Hussars and Transylvanians are accustomed to slit the nostrils of their horses, under a notion of giving their breath a free passage, and improving their wind, as well as to render them incapable of neighing, which, in the field, would be often inconvenient. The Croatian horses are nearly allied in qualities and character to the Hungarian and Bohemian: these, as well as the Poles, are remarkable for being, as the French term it, "Bogut," or keeping the mark in their teeth as long as they live.

5557. *The Polish horses* are hardy, strong, and useful, but they are generally of a middling size. In the marshy parts of Prussia, and towards the mouth of the Vistula, there is a breed of tall, strong horses, resembling those of Friesland, but of inferior value.

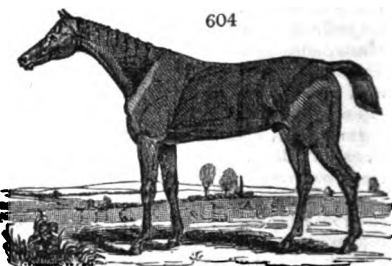
5558. *The horses of Russia* are not much regarded by other nations. They are small but hardy, and capable of enduring great fatigue. Great attention is, however, paid to such as are very fast in their trot, and such a breed is much encouraged for trotting matches on the snow and ice. Those of the Turkish breed are handsome and finely shaped, but too slight and weak for heavy cavalry. The Kalmuck horses are somewhat higher than the Russian common horses, and are so lasting and constitutionally strong as to be able to run three or four hundred English miles in three days. They subsist, summer and winter, solely upon grass in the great deserts which are between the rivers Don, Volga, and Yaik, where they are collected in great herds of four hundred, five hundred, or even a thousand. They are excellent swimmers, and pass the river Volga, where it is from one to two miles broad, with great ease.

5559. *The horses of Sweden* are low and small, and the Norway breed may be comprehended under the same description, but they are strong, hardy, and active. Denmark, and also Holstein and Oldenburg, boast a large variety of horses, which has long been esteemed as peculiarly adapted for heavy cavalry and carriage uses, though they are apt to fail with respect to elegance of limb and symmetry of parts; their heads being large, their shoulders heavy, their backs long, with croups too narrow to correspond with their fore parts. In the islands of Feroe there is a race of horses of small growth, but strong, speedy, and very sure-footed. They are never shod, and feed abroad without shelter both summer and winter. In Suderoe, one of these islands, they have a peculiarly swift breed, of great use to the inhabitants, who catch their sheep, which are wild, by hunting them with a dog, pursuing them at the same time with their horses. The horses of Lapland are small of stature, but active and willing; they are used only in

the winter season, in drawing sledges over the snow, and transporting wood, forage, and other necessities; but in summer they are turned into the forests, where they form separate troops, strictly confined to their own quarters.

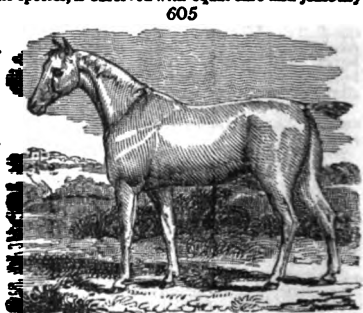
5560. *The British varieties of saddle horse may be reduced into the racer, the hunter, the improved hack, the old English road horse, the galloway, and the pony; the two latter of which we shall consider in another place.*

5561. *The race horse (fig. 604.) is descended, some from Arabians and others from Barbs, but principally the former. Races or courses were very early a part of British sports; and it is natural to suppose that on this account, endeavors would be made to improve and enlarge the breeds of the native horses. Roger de Bellesme, Earl of Shrewsbury, is the first on record who imported a Spanish stallion, whose progeny was afterwards extolled by Michael Drayton, in his *Polyolbion*. In the reign of Henry IV., public ordinances were made favorable to the improvement of the breeding of horses. The courses of those times were, however, probably little more than ordinary trials of speed between the *indigenas* or the slightly improved breeds; and it was not until the days of Henry VII. and VIII., that the true Arabian horses were imported. During these reigns, stallions from Arabia, Barbary, and Persia were procured, their progeny were regularly trained to the course, and from these periods we trace that gradual cultivation of the English race horse, which has, at length, produced a breed unrivalled throughout the world for symmetry of form, swiftness of progression, and durability under exertion. The accounts on record of feats performed by some of our horses on the turf are truly astonishing. Bay Malton, ran at York, four miles in seven minutes and forty-three seconds. Childers, known by the name of the flying Childers, moved through a space equal to eighty-two feet and a half in a second. After these Eclipse, Highflyer, Matchem, Hambletonian, and others, have contributed to keep up the reputation of the English racer.*

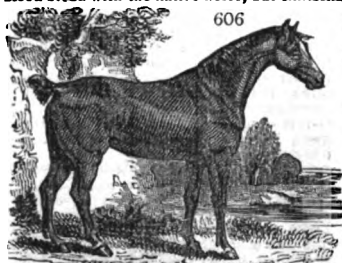


5562. *Climate has a great influence over the form of animals, and that form is found indigenous to each, which best fits it for the purposes required of it. In the arid plains of the east where herbage is scarce, a form is given which enables its brute inhabitants to readily transport themselves from one spot to another; and as in every situation the flesh of the horse is greedily sought after by the predatory tribes, so here, where those are peculiarly strong and active, the horse is formed peculiarly agile and swift to escape their attack, as well as peculiarly light, that his weight might not sink him in the sandy plains, nor his bulk retard him in his flight. Removed, however, to more temperate climes, where vegetation affords by its luxuriance more nutriment, and where the restrictions of danger have ceased to operate, we no longer see him equally small and slender, but with equal capacity for swift progression, we find him expanded into a form capable of keeping up that progression with a durability unknown to the original breeds from whence he sprang. Symmetrically formed as we now see him, he at once evinces his claim to great speed. His osseous or bony skeleton exhibits a base founded on the justest geometrical principles, presenting a series of lengthened levers acting by means of a condensed muscular and tendinous organisation of great power, on angles capable of great flexion and extension: while his pointed form fits him to cleave that atmosphere, from which his deep chest enables him to draw by extensive inspirations wind and vigour to continue his exertions. Purity of blood, by which is meant the result of confining to particular races or breeds the means of continuing their species, is observed with equal care and jealousy by the breeders of the English race, as by the Arabians; and turf jockies assert they can discover a taint or departure from this purity to the sixteenth remove.*

5563. *The hunter (fig. 605.) is derived from horses of entire blood, or such as are but little removed from it, uniting with mares of substance, correct form, and good action. In some instances hunters are derived from large mares of the pure breed, propagating with powerful stallions of the old English road horse. This favorite and valuable breed is a happy combination of the speed of the Arabian, with the durability of the native horse. More extended in form, but framed on the same principles, he is able to carry a considerable weight through heavy grounds with a swiftness equalled only by the animal he pursues, and with a perseverance astonishing to the natives of every other country. Hence the extreme demand for this breed of horses in every European country; our racing stallions being now sent to propagate in the eastern climes, from whence they were some of them originally brought.*



5564. *The improved hackney (fig. 606.) is derived, like the former, from a judicious mixture of the blood breed with the native horse, but exhibiting a greater proportion of the latter. Hacknies are now, however, mostly bred from stallions possessing nearly the same proportion of blood with the hunter; but with a form and qualities somewhat differing. In the hackney as safety is as requisite as speed, we look particularly to the fore parts to see that they are high and well-placed; that the head is not heavy, nor the neck disproportionately long or short; that the legs stand straight, (that is, that a perpendicular line drawn from the point of the shoulder should meet the toe); and that the elbows turn out: and although a perfect conformation in the hinder parts is necessary to the hackney, it is in some measure subordinate to the same perfection in the fore parts; whereas in the racer and hunter, but particularly in the former, the form of the hinder is even of more consequence than that of the fore parts.*



5565. *The old English road horse. This most useful breed is now nearly extinct, although some northern agriculturists appear to be making efforts to revive the race. It has so long been known in this country that it might almost be reckoned among its indigenes: although it is probable that it originally sprang from a judicious culture from horses of Norman, German,*

lost. The *ilium* is the most considerable, and forms the haunches by a large unequal protuberance which, when very prominent, occasions the horse to be called ragged hipped. The next largest portion is the *ischium* or *hip bone*, on each side. It forms a part of the cotyloid cavity, or hollow for the thigh bone, and then stretches back also into a tuberosity which forms the points of the buttocks. The *pubis* or *thigh bone* is the least of the three: in conjunction with the former it forms the *acetabulum* or cavity in which the head of the thigh-bone lodges. The pelvis or basin is attached to the sacrum by ligaments of immense strength; but it has no bony union, by which means, as in the fore extremities, some play is given, and the jar of pure bony connection is avoided. The *os coccygis*, or bones of the tail, vary from eight to sixteen, but are very commonly thirteen or fourteen.

5643. The *thorax* or *chest* comprises the sternum or breast bone, and the ribs. The *sternum* (*w*) of the horse is inclined like the keel of a ship to which the ribs are attached by strong ties. The *ribs* (*s s*) are usually eighteen to each side, of which eight articulate with the sternum, and are called *true*, while the remaining ten, uniting together by intervening cartilages, are called *false ribs*. The centrals are the longest, those more anteriorly as well as posteriorly are less so: the first is placed perpendicularly, the second less so, and their obliquity as well as dimensions increase as they advance, so as to enlarge the chest to an almost circular form, which is the most desirable; but when they are less arched, the belly partakes of the defect, and a flat-sided horse is always without much carcass also.

SUBJECT. 3. The Anatomy of the Extremities.

5644. An examination of the bony parts of the limbs excites our admiration at the wonderful mechanism displayed in their formation: but this is not all, they must be regarded as presenting parts which appear less useful than intended to keep up that vast chain of continuity and similarity observable throughout nature's works. In the following explanation we shall have occasion to notice several of these.

5645. The *scapula* or *shoulder blade* presents itself first (*t, l*), and is a broad and rather triangular bone very unlike the same bone of the human figure, having neither acromion, coracoid, nor recurrent process: neither is its situation at all similar to the human blade bone applied to the back; for in this instance the bone may be said to have no proper back, but to be made up of sides and chest. In man, the scapula is in a direct angle with the humerus, but in the horse it does not pass out of the plane of the arm. Its superior surface is furnished with a considerable cartilage (*l, w*), by means of which its surface is augmented without weight. The posterior surface ends in a superficial cavity called *glenoid*, which receives the head of the humerus or arm bone. It is divided in its upper surface by its spine. The shoulder blade, as has been already shown in the exterior conformation, has neither bony nor ligamentous union, but is held in its situation by very powerful muscles, as the *serratus major*, *pectorals*, and others. Its usual situation is to a plane perpendicular to the horizon, at an angle of thirty degrees; and it has a motion in its greatest extent of twenty degrees: hence, as it does not pass beyond the perpendicular backwards, so the more oblique its natural situation, the more extensive are its motions.

5646. The *humerus* or *arm bone* (*m*), is so concealed by muscles as to be overlooked by a cursory observer, and hence the radius or next bone is popularly called the arm. It extends from what is called the point of the shoulder, but which in fact is a protuberance of its own to the elbow, forming an angle with the scapula, and extending obliquely backwards as that does forwards. Near its upper extremity it sends off a very powerful head to articulate with the shoulder blade. The motions of the humerus are necessarily confined to a removal from its inclined point backward to the perpendicular line of the body. When this bone is too long, it carries the fore legs too much under the animal, and if this defect be joined to a shallow upright shoulder, the evil will be increased. It however fortunately happens that with the angle and extent of these two parts are usually regulated by each other.

5647. The *fore arm* (*n, o, o*) is composed of the *radius* (*o, o*), and an appendage united to it, which in man and some animals, forms the *ulna* (*n, n*), but which as the leg of the horse requires no rotatory motion was unnecessary in him. Here, however, to keep the link of resemblance in all her children of the higher order, nature has stretched out a large process; which in the colt is really distinct, and may then deserve the name of *ulna*; and in the adult horse unites with the radius, and serves as an attachment to muscles. On the slightest inspection of the skeleton, it will appear how much the motions of the fore leg must depend on the length and obliquity of this process; which acting on the principle of a lever in the extension of the arm, must necessarily, as it is either long or short, make all the difference between a long and a short purchase. The breadth of the arm as it is called, at this part, will from this reasoning be seen to be very important. This bone articulates with the knee by its inferior portion.

5648. The *carpus* or *wrist*, called the *knee* (*p, p*), is composed of seven bones, whose principal uses appear to be to extend the surface of attachment of ligaments and tendons, and by their interruptions to lessen the shocks of progression. It may be remarked that all hoofed quadrupeds have the anterior extremities permanently in the state of pronation, or with what is called the back of the wrist turned outwards. The carpal bones articulate with each other, and have one investing capsular ligament, by which means the smallest wound of the knee which penetrates this ligament, has the effect of opening the whole joint: hence the quantity of synovia or joint oil which escapes in these cases, and hence also the dangerous consequences which ensue.

5649. The *metacarpus* (*q, q, r, r*), *canon* or *shank*, is formed of one large metacarpal bone (*q*), and two small ones (*r*). Here the wide palm of the human, and the paw of the digitated animal, is formed into one solid cylindrical bone, and two small additamenta, called *splint* bones; which are united with it by strong ligamentary attachment, converted by age into a bony one. Although these additions may somewhat increase the surface of attachment, their principal use appears to be to keep up the connection with the digituli, of which they appear the rudiments. In the cow there are no splint bones, but the uniformity is more perfectly kept up by the divided hoof: in her, therefore, the canon branches at its inferior surface into condyles for the reception of the two claws.

5650. The *pastern* (*t, t*). The rest of the extremity below the canon, consists of one phalange only, comprising all the mechanism, and a double portion of complexity of all the phalanges of the digitated tribes. Four bones enter into its composition with two small *sesamoids* (*s s*) to each fetlock; placed there not only to act as a spring and prevent concussion, but to throw the tendon of the foot which runs over them, farther from the centre of motion. The pastern bone is situated obliquely forward, and on which obliquity depends the ease and elasticity of the motion of the animal: nevertheless when it is too long, it requires too great efforts in the tendons and ligaments to preserve it in its situation; and thus long jointed horses must be more subject to fatigue and to strains than others.

5651. The *lesser pastern* or *coronary bone* (*t, v*) receives the great pastern, and below expands into a considerable surface articulating with the coffin and navicular bones.

5652. The *coffin bone* (*v v*) forms the third phalange, and corresponds in shape with the hoof. It is very porous, and laterally receives two prominent cartilages. It is around the outer surface of this bone that the sensible laminae are attached; and the inferior surface receives the flexor tendon.

5653. The *navicular nut* or *shuttle bone* is situated at the posterior part of the coffin, and unites with that and the preceding bone.

5654. The posterior extremities differ much from the anterior, not only in their superior

strength, and in the different lengths and directions of the parts, but also, in some degree, in their uses.

5655. *The femur or thigh bone* (3, 4) is the largest of the body, its vast indentations and risings, almost peculiar to it, shew the great strength of the muscles inserted into it. It articulates with the acetabulum or hip joint by a strong head called the *whirl-bone*. In this situation it is held not only by a powerful capsular ligament, and still more powerful muscles, but by an admirable contrivance resulting from a ligamentous rope, which springs immediately from the middle of its head, and is firmly fixed within the socket of the joint. In its natural situation it is not perpendicular as the human femur, but inclines to an angle of about 45°. This bone presents large protuberances for the attachment of very powerful muscles called trochanters. Throughout it exhibits a mechanism uniting the combined qualities of celerity and strength unknown to other animals. The inferior end of this bone is received by its condyles into depressions of the tibia, while the patella or knee-pan slides over the anterior portions of both bones.

5656. *The patella* (5), which is by farriers called the stifle, is nearly angular, and serves for the insertion of some of the strongest muscles of the thigh, which are then continued down to the leg. It thus appears to act as a pulley.

5657. *The tibia or leg bone* (6, 6) is usually in horsemen's language called the thigh. It is a bone formed of a large epiphysis, with a small attached part called the fibula (7), a long body, and an irregular inferior end, adapted to the peculiarities in shape of the principal bones of the back with which it articulates. The obliquity in the situation of this bone corresponds with that of the femur, being as-oblique backwards as the former is forwards. The length of the tibia is a prominent character in all animals of quick progression; and in this respect it corresponds with the fore arm, and the remarks before made on that, apply with even more force to this—that length is advantageous to the celerity, but less so to the ease of the motion.

5658. *The fibula* (7, 7) forms a prominent instance, in common with the splint bones, of what was remarked in the outset of our osteological detail of the extremities—that many parts whose uses were not apparent, would be found to be organs of harmony, placed in the body to prevent the interruption to the completing the general plan of animal organization. In this way the *fibula* appears but a process springing from the posterior part of the tibia, forming but the rudiments of the human bone of that name. In the ox it is wanting; in the dog and cat, as requiring numerous motions in their limbs, it is, on the contrary, perfect.

5659. *The tarsus, or hock of the horse* (10, 10), is a striking instance of the perfect mechanism displayed in the bony structure of this admired animal. It is formed by an assemblage of six bones, and sometimes of seven; while in the ox, sheep, and deer, there are seldom more than five. Between these bones there is little motion, yet there is sufficient to give a spring to the parts, and to preserve the joints from the effects of shocks, &c. As the human anatomy is generally received as the standard of comparison, we must, in order to a proper consideration of the hock, consider it as the instep and heel; and all the parts beyond it as the foot. The human tarsus, and that of some quadrupeds, as the monkey, and some varieties of the bear, makes a right angle with the tibia in standing or walking; but in the horse, the hock makes an open angle with the tibia, and is far removed from the ground. In him and the greater number of quadrupeds, all the bones from the hock downwards are much elongated, and form a part of the upright pillar of the limb. In the horse, therefore, the point of the hock is the true point of the heel, and, as in the human figure, the great twisted tendons of the gastrocnemii muscles are inserted into it: but the appellation of tendo achilles, would be too forced here. A broad hock, as already observed in the exterior confirmation, may be now still more plainly seen to be very important to strength and speed; for the longer the calcaneum or heel bone of the hock, the longer must be the lever that the muscles of the thigh act by; and a very slight increase or diminution in its length must make a very great difference in the power of the joint. It is by this tendon acting on this mechanism, that when the animal has inclined the angle between the canon and the tibia, or in other words, when the extremities are bent under him in the gallop or trot, that he is enabled to open it again. The bones of the hock, like those of the knee, are united together by strong ligamentous fibres; and it is to an inflammation of those uniting the calcaneum and cuboid bones, that the disease called *curb* is to be attributed; and to a similar inflammatory affection of the ligaments in the front of the hocks, that *spavins* of the first stage are owing: in the latter stages the periosteum and bones themselves become affected. The remainder of the bones below do not differ so essentially from the corresponding bones in the fore extremities as to need an individual description. It may, however, be remarked, that the hinder canon or shank bone is longer than the fore, and that the pastern is also the same, but is less oblique in its situation; by which wise provision the horse is enabled to elevate and sustain his body entirely on his hinder parts without danger, which would not have been the case if the obliquity of those parts had been considerable.

SECT. IV. Of the Physiology or Functions of the Horse.

5660. *The admirable mechanism displayed in the composition of the body of the horse, will appear by considering its various functions generally and particularly as a whole.*

SUBJECT. 1. General Functions of the Bony Skeleton.

5661. *The skeleton of the horse* will be found to present nearly a quadrilateral figure, having an inclined cylinder resting on four supporting pillars. The spinal column, as the inclined cylinder, serves as a base for the soft parts, and is found not truly horizontal, but dipping downwards over the fore legs; by which the propelling force of the hinder extremities is relieved by the maximum of strength thus transferred. The increased weight of the hinder part of the cylinder, is admirably counterpoised by the head and neck, which are projected forwards; by these means leaving the line of direction near the centre of the whole. The length of the cylinder may be such as not to support its own weight; nature, therefore, has limited the length of the spines of animals: hence, *celeribus paribus*, a long-backed horse must be weaker than a short one; and thus, likewise, small horses can carry proportionably more than larger ones. The four pillars which support this cylinder, are not perpendicular partially; but they are so totally: for a perpendicular drawn from their common centre of gravity, will be found to fall nearly in their common base, by which means they are supported as firmly as though their individual axes had been in a line perpendicular to the horizon. Had they been perpendicularly opposed to each other, there could have been but little elasticity, and consequent ease in motion; every exertion would have proved a jar, and every increased effort would have produced laxation or fracture. To increase our admiration of this

mechanism, we need only turn our attention to the contra-disposition of these angles in the fore and hinder supporting pillars. Had these angles presented themselves in the same direction, the body must have been precipitated forward or backward; but each offering a counteraction to the other, the body is firmly sustained within them.

5662. *The bony masses are operated on by muscles*, for this deviation from a perpendicular direction in the various bony portions of the limbs, must necessarily have powers to correct it, which is done by the muscles; and wherever the angles are found most extensive, the muscles will be found proportionally strong and large. This muscular exertion, to counterbalance the angular inclination, occasions fatigue; as the set of muscles immediately employed becoming weary, the animal is obliged to call another set into action, which change is necessarily more or less frequent as the animal is weaker or stronger.

5663. *The extent of the action of the bony portions of the extremities*, is the produce of the length and direction of the various parts entering their composition, and of the different angles they are capable of forming, as progression itself is effected by these angles closing, and suddenly extending themselves again. The force of the action arises from the direction of the component parts of the angles, in combination with the agency of the muscles. The repetition of the action is dependant on the muscles alone; but as the original action arose out of the length and direction of the parts, so it will be evident that in every subsequent repetition, it will be more or less extensive, as these are more or less perfect in their formation, even though the muscular exertions should be the same: thus some strong animals cannot move so fast as others with less strength, as the cart-horse and racer, or greyhound and mastiff.

5664. *The bony mechanism of the fore and hinder extremities presents some differences*. That of the fore limb may be said to exhibit altogether a different character. The fore-leg bones are much less angular, and appear framed purposely to receive the weight imposed on them by the impulse of the hinder limbs. This weight they are destined to sustain, until the elevation is forced on them by the tendency the general inclined mass has to meet the ground, or to find its common centre in the earth. The fore extremities, under this view of the matter, could not have been placed with equal wisdom in any other situation, nor have taken any other form. The hinder extremities having less weight on them, and at no time bearing an increase of pressure as the fore do, by the impetus communicated from behind, are much more angular; and their angles, by being thrown into a backward direction, afford the necessary impetus for the projection of the body forward. This important operation of impelling the mass being almost wholly dependent on the hind extremities, as that of sustaining it is principally confined to the fore extremities; so the former are also much stronger in point of muscular apparatus; by which their angles can be advantageously opened and closed with superior effect in progression.

5665. *The appendages to bone* are cartilage or gristle, periosteum, medulla or marrow, ligaments, and synovia or joint oil. *Cartilages* are of three kinds, *articular* (1850.) which cover the ends of the bones by a thin layer, enabling them to slide easily on one another; *nonarticular*, or such as are placed between bones immovably joined; *unattached*, as those of the ears and larynx; and *temporary*, as the ends of bones in very young animals before their earthy deposit is completed. The general nature of cartilage is smooth, white, solid, elastic, and hard. The *periosteum* is a general uniting membrane to bones and their appendages (1845.), on the skull, called *pericranium*; when it covers ligaments, *peridensium*; and *perichondrium* when it invests cartilage. Its uses appear to be to furnish vessels to the bones. It is little sensible, except under inflammation, when it becomes highly so. *Medulla*, or marrow, is a soft fatty substance deposited in the cavities of bones.

5666. *Ligaments* (1854.) are close, compact, fibrous substances, of immense strength in the horse, necessary to bones as a connecting medium; ligament is also a common membrane in every part of the body. The nature of ligament is considered as inelastic; there are, however, many exceptions, of which the cervical and metacarpal and metatarsals are instances. In some cases they are semicartilaginous. The *suspensory* ligaments attach and suspend parts, as that of the thigh bone to its socket, &c. *Capsular* ligaments surround the two opposed ends of jointed bones, and form a complete cavity.

5667. *The synovia* or joint oil, being secreted from the inner surface of the capsular ligaments, fills up this cavity, and affords a slippery medium, which enables the bones to slide readily over each other.

5668. *Muscle* is that part of the body of the horse which we term flesh, to distinguish it from skin, gristle, bone, ligament, &c.; and the phenomena it exhibits, are so universal, that we are warranted in considering that it exists in every animal. Muscles appear composed of bundles of reddish fibres, the ultimate division of which it is impossible to trace. When a number of these fibres are connected together into a determinate form and circumscribed extent, it is called a muscle; and as the motions of an animal are very various, and as almost all motion is operated through the agency of the muscles; so the peculiar shape they take on is very varied. Muscular fibre is spread over the body, and it has been very properly remarked, that our ideas of it are probably too limited: thus it constitutes a principal part of all the viscera, and enters, it is probable, into the composition of many membranes. But what is more generally considered as a muscle, is a distinct body having its determinate parts. To the generality of muscles, particularly to those ending in bones, is added a portion of a very different nature, called *tendon*.

5669. *Tendons* are inextensible, inelastic, tough, fibrous substances, of a whitish colour: expanded into thin layers, they are called aponeuroses. The tendons are eminently useful to muscles, for the size of the termination is thereby diminished, without the strength being decreased. What would have become of the lightsome elegant limb, had their large muscular masses been continued downwards of the dimensions we witness them above in the shoulder and thigh, instead of the condensed substance of the tendons or back, and fore sinews? Muscles are highly vascular, as their color testifies; but the tendons are very little so, hence their powers of life are very different: one can regenerate itself with ease, the other with extreme difficulty. The muscles also possess a large share of nerves, and consequently of sensibility and irritability, to which properties the surprising phenomena they exhibit must be attri-

bated; while their extreme vascularity furnishes them with powers to keep the energies requisite for these agencies. They contract and shorten at pleasure, acquire a power of acting dependant on their situation, and can change the fixed for the movable point, and *vice versa*.

5670. *Muscles are voluntary and involuntary.* The former are immediately under the influence of the will, as those of the legs, eyes, mouth, &c. Involuntary muscles are such as are not under the guidance of the will, and whose functions go on without control, as the heart, the respiratory and digestive muscular organs. Voluntary muscles have usually antagonists, whereby the perpetual tendency to contraction is counterbalanced: they are also usually covered by a cellular or membranous covering, called *fascia*, and their tendons by another, but stronger investiture, called *theca* or *sheath*. At the tendinous extremity there is usually a *capsule* containing a quantity of lubricating mucus, the diseased increase of which forms what is termed windgall.

SUBJECT. 2. *The Blood Vessels of the Horse.*

5671. *The arteries are long membranous canals*, composed of three strata, which are called *tunica* or *coats*, as, an external elastic, a middle muscular, and an internal cuticular. Each of these coats is the cause of some important phenomena, as well in disease as in health. The *elastic* power enables them to admit a larger quantity of blood at one time than another, and thus they are turgid under inflammation: by this also they can adapt themselves to a smaller quantity than usual; otherwise a small hemorrhage would prove fatal. The muscular tunic appears to exist in much greater proportion in the horse than in man, and this accounts for his greater tendency to inflammation, and also why inflammatory affections run to their terminations so much sooner in the horse than in man. The arteries gradually decrease in their diameter as they proceed from the heart. Our knowledge of the terminations of these vessels is very confined; we know they terminate by anastomosis, or by one branch uniting with another. They terminate in veins, and they terminate on secreting surfaces, in which case their contents become changed, and the secretion appears under a totally different form. Another common termination of the arteries is by exhalant openings, by which sweat is produced. The use of the arteries is evidently to convey blood from the heart to different parts of the body, and according to the part the artery proceeds from, or proceeds to, so does it receive an appropriate name.

5672. *The aorta is the principal member of this system.* Originating from the left ventricle of the heart it soon divides into two branches, one of which, the *anterior, or aorta ascendens* (fig. 618 p), proceeds forward to be divided into two principal divisions—the *carotids* (q), by which the head is furnished, and the *axillaries*, by which the fore limbs receive their blood, under the names of humeral, radial, and metacarpal arteries. The *posterior, or aorta descendens* (o), which is distributed to the trunk and hinder extremities, forms the other branch.

5673. *The pulmonary artery is a trunk of five or six inches in length; arising out of the anterior ventricle of the heart, and is continued by the side of the aorta.* It soon divides and enters the lungs, through which it ramifies.

5674. *The veins are vessels, which return the blood of the body which has been distributed to it.* They have less solidity, and possess two tunics or coats only. They usually accompany the arteries in their course, but are more numerous, being wisely divided into a superficial and a deep seated set, to avoid the dangerous effects of interruption. To prevent the return of the blood they are furnished with valves also.

5675. *The original venal trunks of the horse are ten in number; as the anterior cava, the posterior cava, and eight pulmonary, to which may be added the vena portæ.*

5676. *The vena cava* passes out of the heart by two trunks from separate parts of the right auricle. The *anterior, or cava ascendens* (fig. 618 a), opposite to the first rib, divides into four principal trunks; two axillaries, and two jugulars, (fig. 618 r). The axillaries furnish the fore limbs under the names of the humeral, the ulnar, and the metacarpals. The *jugulars* (r) run up one on each side of the trachea to return the blood of the head. The *posterior, or cava descendens* (o), returns the blood from the body and hinder extremities.

5677. *The vena portæ is formed from the veins returning the blood from the viscera, which, uniting to enter a sac of that viscus, are ramified through all parts of the liver, to have some remarkable operation performed in their contained blood.* Collected again after this operation, the blood is returned by the vena hepatica, and carried into the posterior cava.

5678. *The blood is a homogenous fluid, contained in the heart, arteries, and veins, and constantly circulating through the whole body.* It appears formed with the body; is red in the arteries, and purple in the veins (5723.) The component parts of the blood are the cruur or coagulium; the coagulable lymph, fibrin, or gluten; and the serum. The coagulium is composed of red globules, whose intensity of color is less in the horse than in man. A red color is not necessary to the essential properties of blood, seeing the blood of some animals is white; and even some parts of the horse's body are furnished with colorless blood, as the transparent part of the eye, &c. The coagulable lymph or fibrin, (1904.), appears the most essential part of the blood, and from which all the parts are formed. The serum seems to dilute the whole. The quantity contained in the body is uncertain: young animals possess more than older, and hence bear bodily injuries better. It is less in quantity in fat than in lean animals; and in domesticated than in those which run wild. An animal will lose 1.16th before he dies. A horse lost 44 pounds without apparent injury. Probably the quantity contained in the body may vary according to circumstances: between 1.8th, and 1.10th of the whole mass, is a fair medium.

5679. *The pulse.* From the contraction of the heart and consequent dilatation of the arteries to receive the blood, and pass it onward to all parts of the body, which is called the *diastole*; so a dilatation of the heart and contraction of the arteries necessarily occurs, which is called the *systole*; and these two causes operating alternately produce the phenomena of circulation. The momentary increase in capacity in the diameter of the artery is called the *pulse*. As there is seldom disease present, without some alteration in the circulation also, so the pulse is attended to as an indication of health or disease. The circulation being carried on over the whole body, the pulse may be felt universally; but some situations are more favorable than others; as the heart itself, the pasterns, at the root of the ear, &c.: but the most convenient of all, is at the branch of the posterior jaw, where the maxillary artery may be readily detected. (fig. 618 s). The natural pulse in the horse is about 45 beats in a minute; in the ox the same; in man 75; in the dog 90. When the pulse is much accelerated, the circulation is accelerated also. If to its quickness, fulness of vessels and hardness are apparent, the circulation is *morbidly* hurried, and inflammation general or partial is present. (5676.)

SUBJECT. 3. *The Absorbents of the Horse.*

5680. *The absorbent system is a very extraordinary and a very important one, for if the blood builds up and repairs parts, the absorbents pull down, remove, and take them away again.* They are composed of the *lymphatics* and *lacteals*. Both kinds, although thin and transparent, are strong, and appear to have a contractile power: where very minute they are called *capillaries*. The lacteal absorbents are situated in the mesentery and intestines, from whence they draw the chyle or nutritious fluid by which the blood is nourished and augmented, by being carried forward from the mesentery into a tube called the

Thoracic duct, which, passing up by the side of the aorta, pours its contents into the heart through the medium of the jugular vein. The *lymphatic absorbents* differ from the latter only, in being situated over the whole body, and being the recipients of the various matters of the body; whereas the lacteals appear to absorb the chyle only. From numerous facts, we know that the various organs are continually suffering a destruction and a removal of parts, and that what the absorbents take away, the arteries renew; and to this constant change, most of the alterations of the body are to be attributed as regards the structure of parts. We use our power over these vessels in the horse medicinally. We stimulate the absorbents to take up diseased solutions of fluids from various parts of the body, as in watery swellings in the legs by mercury, and by friction, or by pressure in the way of bandage. When deposits are made of hard matter, on ligament or bone, we stimulate them by blistering or by firing. It is by stimulating the absorbents that splints and spavins are removed. Exercise is a very powerful stimulus to absorbents; thus it is that swelled legs are removed by half an hour's exercise. In the horse, the lymphatics are more liable to disease than the lacteals, but in man the reverse. Farcy diseases the lymphatics irreparably.

SUBJECT. 4. Nerves and Glands of the Horse.

5881. *The nervous system of the horse* is composed of white medullary cords, springing from the brain and spinal marrow, whence they are generally distinguished into the cerebral and spinal nerves: the internal structure of these bodies is fibrous, and their ramifications extend to every part of the body; it is supposed that the brain is the seat of sensation and volition, and that the nerves are only the messengers of it. The sensibility of a part is usually proportioned to the number and size of its nerves; nervous influence occasions motion. From some cause, unknown to us, some motions are voluntary, and some involuntary; but both are brought about by nervous agency. As the nerves are the media of sensation; so a division of their cords has lately been attempted, with success, to relieve certain painful affections; the most prominent instance is, in the division of the posterior nerves for the relief of the painful affection of founder. Tetanus, or locked jaw, which seems a morbid irritation on the nerves, has been recommended to be treated in the same way.

5882. *The cerebral nerves*, arising in pairs immediately from the brain, are the *olfactory, optic, motores oculi, pathetici, trigemini, abductus, auditory, lingual, par vagum*, and the pair called the *intercostal* or *great sympathetic*, from its extensive connection.

5883. *The spinal nerves* are those which arise immediately from the spinal marrow, as the *cervicals, humerals, ulnar, metacarpal, and posterior* nerves; the *dorsal, the lumbar, crural, sciatic, popliteal, sacral*, and the nerves, to the posterior extremities, which correspond with those of the anterior.

5884. *The glands* are numerous, and placed in every part of the body; they may be characterized as secretory bodies, composed of all the different vessels inclosed in a membrane; their office appears to be to secrete or form some fluid, as the liver secretes bile, and the kidney urine. They are classed into folliculose, globate, glomerate, and conglomerate; they also receive specific names according to their situations, or according to the fluid they secrete, as lachrymal, salivary, &c.

SUBJECT. 5. Integuments of the Horse's Body.

5885. *The common integuments* may be considered as the hair, the cuticle, the epidermis, or insensible or outer skin, the rete mucosum, which is immediately under this, the cutis, sensible or true skin, the cellular membranes, which contain fat and other fluids, and the *panniculus carnosus* or fleshy pannicle; to these may be added, the *unguis*, nails or hoofs, which we shall describe separately.

5886. *Hair* is the clothing of brutes, and hence is very important to them, and as it enters largely into the arts, it is also important to us. (1814.) It appears to be a production of the true skin, arising from a bulbous end, which penetrates the rete and cuticle in the form of an elongated cone. In some parts hairs appear singly, as about the muzzle; in others in masses, as on the mane, tail, and over the body generally, as an inclined congregated mass; hair varies in color, and therefore appears by nature intended both for ornament and use.

5887. *The cuticle* is situated immediately under the hair (1807.), and appears a hard insensible covering, purposely placed to guard or defend the sensible skin underneath. The cuticle lines many of the large openings of the body, as the mouth, from whence it is continued into the stomach, lining one half of it. It is perforated by innumerable small vessels that give out and take in various matters; through these blisters act on the true skin, inflame it, and force it to secrete a quantity of fluid, which thus pushes the cuticle from the cutis. It exists before birth, and is speedily renewed after birth, when accidentally destroyed, and, like the true skin, thickens by pressure; it is constantly undergoing changes; it exfoliates in the form of powder, or little scales, over every part of the body, and is that substance called dandriff, which grooms are so careful to remove with the currycomb. The *rete mucosum* is a mucilaginous substance placed like a net between layers of cuticle and cutis; and although very universal in animated nature, its use is unknown.

5888. *The cutis, corium, or true skin*. (1810.) This very general investiture of the body is situated immediately under the two former; it is very vascular, and is furnished with innumerable small villous processes of exquisite sensibility, and which, without doubt, were intended to constitute it as the real organ of touch. It is much thickened by pressure; asses, from the beatings they are subjected to, have it of immense thickness on the rump. It naturally also exists in various degrees of density according to the wants of the animal. Like the cuticle it is perforated by numerous openings which correspond with those of the latter membrane. Its composition appears principally gelatine, and hence it is employed in the manufacture of glue; its gelatine uniting with the matter called tannin, becomes insoluble in water, and then forms leather; and the value of the horse's hide in this particular is sufficiently known.

5889. *Adipose membrane and fat*. These form very considerable parts of the body of most animals. The adipose membrane is not so universal as the skin; some parts are completely without it, as the eyelids, ears, sheath, and some parts of the extremities. It is cellular, but the cells fortunately do not communicate or the fat would gravitate. The fat is the unctuous juice poured or rather secreted into these cells. It appears in greater quantities, and in different degrees of consistence in some parts than in others: in the belly of some it is lard, and suet in others; within the bones it is oleaginous in all. Different quadrupeds have their fat of different degrees of consistence, from the firm suet of the ox, and the tallow of the sheep, to the soft lard of the hog, and the intermediate state of the horse; it guards the parts, it preserves warmth, but above all, it is a depot against occasional want: thus a fat animal can sustain itself without food much longer than a lean one. The torpid bear comes from his hibernation emaciated, because his constitution has been subsisting on his fat.

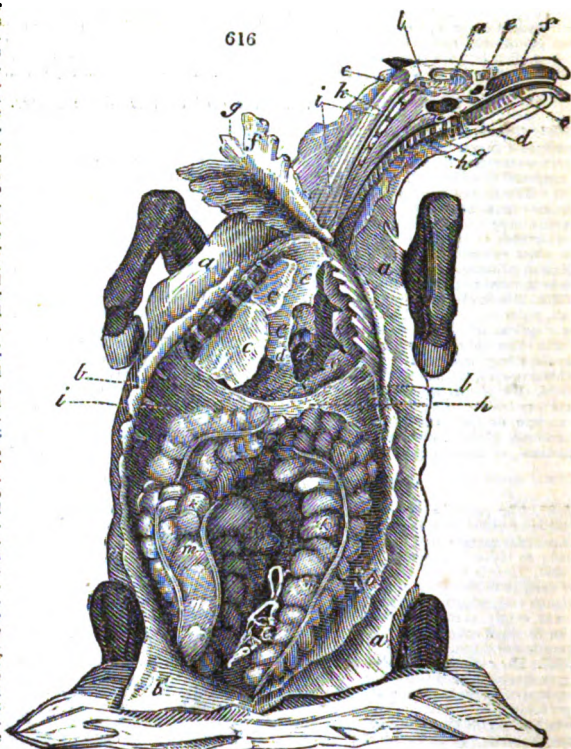
5890. *Cellular membrane*. (1812.) This complete investiture of the body enters every part, and is formed of communicating cells, as we see by the practice of butchers who blow up their meat; and also by the emphysematous effects of a fractured rib, and the gaseous distention in some putrid diseases; it exists in different quantities, and under various modifications of density throughout the body, and is a very universal medium of connection in the form of ligament.

5891. *Panniculus carnosus*. (1819.) The fleshy pannicle was kindly given to quadrupeds in lieu of hands, to enable them to corrugate or pucker the skin, and thus to shake off dust and insects. It is a thin muscular expansion peculiar to brutes, but not to all; the swine firmly being denied it. By its attachments it can operate variously, as we see by the uses the horse makes of it; it is very vascular, and sensible also from the numerous nerves which enter it.

SUBJECT. 6. *The Head generally.*

5692. *The parts of the head* are external and internal; some of these have been touched on, as the integuments, &c.: such as have not will follow in the order of their magnitude or situation.

5693. *The brain of the horse* (fig. 616 a, b, c), is contained within the hollow of the skull, and is surrounded by two coverings, the dura and pia mater, between which lies a third membrane called the tunica arachnoides. The duplicatures of these membranes are called septa and falx. The brain is divided into three portions, the cerebrum, cerebellum, and medulla oblongata. The cerebrum, or greater brain (a), is divided into two hemispheres and two lobes; it has an outer or cortical substance, and an inner, the substantia alba, or medullary matter. The cerebellum, or lesser brain (b), is contained within the occipital bone, and is in the horse placed superiorly and posteriorly to the cerebrum. It is less than the cerebrum, and is divided into four lobes, and like the former is composed of two substances, a cortical and a medullary. The medulla oblongata (c) is a medullary continuation of the cerebrum and cerebellum, and is continued upwards and backwards to the edge of the foramen magnum of the os occipitis, to be continued under the name of spinal marrow. The medulla spinalis, or spinal marrow (h), is a direct continuation of the medulla oblongata, and like that is composed of a cortical and medullary part. It has lately been discovered to be hollow in the horse, ox, sheep, hog, and dog. It leaves the skull by the great foramen of the occipital bone, and is continued backwards in a bony canal formed by the vertebrae, giving off in its passage the spinal nerves in pairs. The brain presents four cavities called ventricles, it has also many prominences, and peculiarities, which our limits will not admit of noticing, but which is less necessary, as in no part of brute anatomy is the analogy so close to the human as in the brain of the horse. With the exception of the situation, to describe the one is to portray the other.

SUBJECT. 7. *The Ear.*

5694. *The number and situation of the ears* of the horse are sufficiently known. The internal parts do not differ from those of the human, but the outer are adapted to his situation and habits. These exterior parts are composed of the skin, the outer hair, the cartilages, and the muscles by which they are moved. The skin within the ears is furnished with sebaceous glands, which secrete a bitter matter, noxious to insects; and further to guard against these, it is filled with hair; which the false taste of grooms induces them to remove, and thus to expose the animal to dust, hail, rain, and insects.

5695. *The form of the ear is dependent on the concha cartilage*, which is found pointed and small in the Arabian, but large and broad in the heavy breeds. The cavity within the concha is thrown into folds throughout, which increases its surface, and reflects the sonorous waves. This outer ear is attached to the internal, by connecting cartilaginous portions and appropriate ligaments. The parts of the internal ear are, the meatus auditorius internus, or passage; the membrana tympani, or separating membrane between the external and internal parts; the tympanum, drum, or barrel of the ear; and the labyrinth. The eustachian tube is an opening at the upper and anterior edge of the hollow of the tympanum, forming a duct which is in part bony, and in part cartilaginous; extending from the tympanum to a large and peculiar cavity at the posterior part of the nasal fossa.

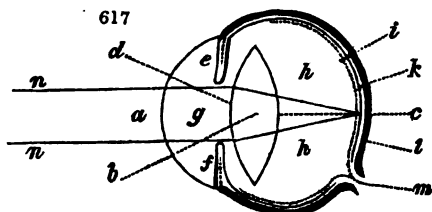
5696. *The sense of hearing* is formed through the medium of the expansion of the soft portion of the auditory nerve over the internal ear; sounds, therefore, entering the cavity of the concha, are reflected alternately from its sides into the tympanum, whose oscillations are imparted to the brain.

SUBJECT. 8. *The Eye and its Appendages.*

5697. *The appendages to the eye* are first, a funnel-shaped cavity formed by the concurrence of the bones of the skull, called the orbit, not placed directly in front as in man, but inclining laterally, to enable the animal to embrace a larger field of view. The eyelids are an upper and under, of which the upper is the most considerable, and

enjoys the greatest motion. United, they form an admirable curtain to defend the eye from dust, insects, and the light during sleep; and are moved by two appropriate muscles. Attached to the edge of each is a cartilaginous rim, called the tarsus. The *cilia*, or eyelashes, are not, as in the human, above and below; the upper lid only is furnished with hairs, and which are not placed in one, but in several smaller rows. The horse has no supercilia or eyebrows, unless we reckon as such the few long hairs over the orbits. The *lachrymal gland* is a body lodged within the upper part of the orbit, and is furnished with five or six excretory ducts, which secrete the lachrymæ or tears to lubricate the surface of the globe. The superfluous tears are carried off by two openings at the inner angle, called *puncta lachrymalia*, by which means the tears are at once carried into the nose, and not as in man first into a lachrymal sac. The *caruncula lachrymalia* is a small black substance in view at the inner canthus, whose office appears to be to direct the tears aright in this course. The *haw*, or *nictating membrane*, is an important part, seen when the eye is drawn inwards, but which is at all other times hidden within the fatty matter surrounding the globe of the eye. Though called a membrane it is cartilaginous, and when the eye is forcibly withdrawn into the socket, it is pressed out from the inner angle, and passes completely over the surface of the globe, to which its shape is adapted. A moderate pressure only, shows about half of it; and it is thus seen in tetanus or stag-evil, by the action of the retractor muscle; and under inflammation of the eye it also becomes visible, which has led ignorant farriers to cut it off, under a suspicion that it formed one cause of the disease. The use of this nictating membrane cannot be for a moment dubious. It is denied to man and to monkeys, because they, having hands, can with their fingers remove dust and dirt from the eyes; but to the horse and most other quadrupeds, it is essentially necessary for these purposes.

5698. A diagram of the eye (fig. 617.) displays the transparent cornea in front of the eye (a), the crystalline lens (b), its posterior convexity (c), its anterior convexity (d), the iris, or curtain (e, f), the anterior chamber occupied by the aqueous humor of the pupil (g), the posterior chamber filled with the vitreous humor (h), the retina (i), the choroid coat (k), the sclerotic coat (l), and optic nerve (m), rays of light showing the different degrees of refraction they suffer in passing through the humors of the eye (n n).



5699. The globe of the eye is composed of coats, chambers, and humors, and is operated on in its movements by muscles. It may be considered as forming a large cup posteriorly, with a smaller cup applied to its margin anteriorly; or as though the segment of a large sphere were adapted to that of a smaller one. The substance which gives figure and consistence to the larger segment is the *sclerotic coat* (l), which is very firm and fibrous. The anterior cup or segment is supplied by the cornea, which is transparent, and formed of thin concentric plates of very different degrees of convexity in different animals, and often of similar animals; to a defect in which is ascribed the indistinct vision or starting of some horses. The *cornea* (a) is vascular and sensible, and in an inflamed state it admits the red blood, as we see by the universal redness over the whole; at other times it admits only the colorless parts of that fluid. Immediately within the sclerotic coat is a thin vascular membrane, called the *choroides* (k), which is spread over it nearly as far as the cornea, where it turns in and expands into the ciliary processes. It also, by a peculiar fold, forms a ligament, after which it produces another projection into the cavity of the eye, termed the *uvea*. It is here continuous, and presents a veil perforated in the centre.

5700. The *pupil of the eye* (g) is the perforation which is seen annular in the human, oblong in the horse, ox, and sheep, and perpendicular in the cat. The anterior surface of the uvea is covered with a membrane, termed *iris*, on which the color of the eye depends; in man it is grey, brown, black, or blue; in the horse it is usually brown, but now and then white, when the animal is said to be wall-eyed. At the central margin of the iris are seen, in a strong light, some little globular bodies or bags, covered with a black pigment. They are usually attached to the upper margin only, but when any exist on the lower they are small; they have been mistaken for disease. The *iris* (e, f) is capable of accommodating itself to circumstances; that is, it can enlarge the diameter of the central aperture or pupil (g), so as to admit or shut out the rays of light. Over the central surface of the choroid expansion is spread a dark mucous substance, called *nigrum pigmentum*. In animals, whose vision is distinct at night, this pigment is found of a lighter color; in man it is very dark, and his crepuscular vision is, therefore, indistinct. In the grazing tribes it is of a greenish cast, lost in azure blue; in the predaceous tribes it is still lighter. Under this pigment is the mucous expansion, peculiar to quadrupeds, called *tapetum*. The *optic nerve* (m) penetrates the sclerotic coat, and becomes expanded on its inner surface, in a membranous lamina of exquisite fineness, called *retina*. On this it is supposed objects are painted, and thus taken cognizance of by the brain.

5701. The *humors of the eye* are the vitreous, the crystalline, and the aqueous. The vitreous humor (h) is of a jelly-like consistence, and occupies all the globe, except those parts taken up by the other humors. The *crystalline humor* forms a lenticular body of moderate consistence, and is, therefore, more properly called a *lens* (b). It is doubly convex (c, d), its posterior side resting in a concavity of the vitreous humor. It is not of equal consistence throughout, being much firmer in the middle. Different animals have the lens of different figures, to suit the purposes of their existence: in fishes it is nearly spherical, but in quadrupeds, lenticular. It is a diseased opacity of this body that forms cataract. The *aqueous humor* is a limpid fluid which fills up the spaces not occupied by those already described.

5702. The *muscles of the eye*. The motions of the eye ball are operated by seven muscles; four recti or straight, which elevate, depress, and draw to and from; two oblique, which rotate the eye, and a retractor or choanoid, which is peculiar to quadrupeds, to draw the eye within the socket, and thus preserve it from danger, draws the globe onwards.

5703. The *phenomena of vision*. If the diagram be examined, it will be evident that the eye of the horse presents an optical instrument of exquisite workmanship and mechanism, admirably fitted to collect the luminous rays from the various objects around, and to transmit them with truth to the brain. If the

luminous rays reflected from objects passed through the eye in a rectilinear course, as they do through the atmosphere, no cognizance at all useful to the animal could be taken of them by the eye; all would be glare and indistinctness: but being refracted or bent by the media, through which they pass, the rays finally meet at a point called their focus or focal point. Neither would one simple line of refraction have been sufficient to have answered all the purposes of perfect vision, under its various modifications. It is necessary that the refraction should be increased in its passage by increased degrees of density in the media of its transit (*see*). In the passage of the rays through the cornea and aqueous humor, they must encounter their first refraction; and it is evident, that the more convex the anterior portion of the eye may be, the more will this refraction be increased. We need not, therefore, be surprised that a goggler, or horse with this form of eye, should start. The next and largest degree of bending which the rays receive occurs in their passage through the crystalline lens, which from its lenticular form must necessarily be considerable; in their progress through the vitreous humor a farther refraction is effected, till meeting in a point on the retina, a perfect representation of the object or objects viewed is obtained; the rays forming in their passage numerous cones, the basis of which will be the object viewed, and the apex of each a radiant point. Amidst the number of objects around, it appears that the eye has a capability of collecting rays from such only as are immediately necessary for the purposes of the animal it belongs to; hence, although the general field of view may fall under an angle of vision, yet such rays only as are immediately capable of this convergency produce effect, all others are lost in the black pigment of the eye, apparently placed there purposely to absorb the superfluous rays. As the eye must necessarily have a vast variety of objects painted on it, whose distances are widely different; there must be some optical adjustment of the powers of the part to enable it to effect a distinct vision of all objects near or remote. But whether this takes place by means of the angle formed on the two opposite axes, or as has been more lately taught, by a muscular power in the lens itself, is not yet satisfactorily ascertained; certain it is that after the loss of one eye, time is required both in the human and brute subject for the remaining eye to learn to adjust itself to judge of relative distances; which fact is certainly in favor of the opinion that an angle formed between the eyes regulates the judgment of distances. In this way we can account for the well known fact, that hunters, which have before the loss of an eye been excellent and sure leapers, have afterwards lost the power of measuring their leaps. Were it not for some adjustment of the optical organ itself, the rays reflected from objects very near the eye would fall behind it, and those from distant ones would, from being almost parallel, meet together before the retina. The mechanical adjustment of the focus is also assisted in some measure by the iris, which contracts almost to a point when we look at a very minute object; and by this means only permits such rays to pass through as penetrate the centre of the lens, by which such rays will be very much refracted; but when the eye regards distant objects, the iris becomes dilated, and the rays are then viewed through the edges of the lens, and their inclination is thereby lessened.

5704. *The criteria of soundness in the eyes are gained by a careful examination of them; and which experience has shown to be best made by placing the horse within a stable, with his head nearly approaching the stable door, which should be fully open. Small eyes are found more prone to inflammation than large, and large goggling eyes are more liable to accompany a starting horse than lesser ones: and when the convexity is extreme, not only is the starting in proportion; but such eyes are more liable than others to become affected with the disease popularly termed glass eyes, but correctly gutta serena. It is not however to be understood that all starters have defective eyes; many are so from natural timidity, and still more from harsh usage. The eyes should be examined together, not only to observe whether each presents an equal degree of clearness in the transparent part and within the pupil; but also that an equal degree of contraction exists between each of the pupils. This is of much consequence: if any inequality in size or form be observable between the pupils, the least of them has been in some way affected, and will probably become so again. It is even more suspicious when a turbid milkiness appears on any part of the transparent portion; and equally so, when the inferior part looks other than clear; or in a very strong light, with a lively bluish tinge. When it is at all turbid, viewed under various aspects, regard it attentively, and there may probably be found an inward speck of perfect white; which is the nucleus or central point of an incipient cataract.*

5705. *A glassy greenish cast in the eye should occasion suspicion, and the hand should be placed over such eye so as to exclude the light; remove the hand suddenly and watch the motions of the iris or curtain of the pupil. If it do not contract, carry the examination still further, and it will probably be found such eyes are totally blind. A blind horse usually carries his ears about, as though in alarm, on his leaving the stable; he also lifts his feet on such occasions, particularly in strange quarters, higher than a sound horse.*

SUBJECT. 9. *The Nose and Sense of Smelling.*

5706. *The organ of smell is, in most quadrupeds, the next in importance to that of vision, and in many points of view it is even more so. With the herbivorous tribe, it forms their principal means of judging between the noxious and the innoxious. It is not therefore to be wondered, that it should in these tribes form so large a portion of the head; nor that it should be so exquisitely gifted with sensibility, or so admirably formed to answer its important purposes. The external parts of the nasal organ are the two nostrils, and as much of their convolutions and linings as come into immediate view. Internally these two cavities are carried upwards into the pharynx, but completely divided by a cartilaginous septum, (*fig. 618 f*). In this course they communicate with numerous openings and cavities, formed within the bones of the skull, (5631.) the whole of which are lined by one continuous membrane of exquisite vascularity and sensibility; being largely furnished with blood vessels, which gives them such a ready tendency to inflame and become red, as we witness under only a slight degree of exertion, and as we see more evidently when violent colds or inflammations on the chest are present. Its sensibility is derived from the olfactory nerves, which are spread over all its surface. It is this membrane which is the peculiar seat of glanders, becoming first inflamed, and next ulcerated throughout its extent; and as the membrane itself appears to be continued to the pharynx and larynx, so we need not wonder why the glanders proceeds to disease the lungs; nor why a common cold, which is at first a simple inflammation of this membrane, so readily degenerates into inflammation of the lungs. The common integuments or coverings of other parts are extended over the nose, but it is little furnished with fat. Of hairs it has a fine thin covering to the edges of the nostrils, and a longer set, which are carefully removed in trimming. By a fold of the skin, within which is a cartilage, the false nostril, as it is termed, is formed, whose use appears to be to keep open the canal for the transmission of air, and yet to offer an interruption to extraneous matter. When the nostrils are a little separated, a small canal may be seen, which is the nasal duct for the transmission of the superfluous moisture from the eyes. The horse breathes or respires wholly through his nostrils in all ordinary cases.*

5707. *The sense of smelling. The volatile particles from all odorous bodies are continually passing off from them, and consequently some must reach the olfactory organs, whose capability of taking cognizance of their qualities appears derived as before pointed out, by the expansion of nervous fibrillae from the olfactory nerves which transmit impressions to the brain.*

SUBJECT. 10. *The Cavity of the Mouth.*

5708. *The external parts of the mouth are the lips, cheeks, and beard. The lips are made up of fleshy masses so disposed as to give them motion every way; they are covered over with a very fine expansion of skin almost devoid of hair, their exquisite sensibility forms them into an organ of touch; and in this*

SUBJECT. 14. *The Organs of Generation.*

5739. The *male generative organs* are most of them external, on the contrary in man they are mostly internal; but in both the one and the other they are connected with the urinary organs, so that one general formation is made to answer a double purpose.

5740. The *male organs of generation* consist of the *testes* or *testicles*, which are two in number, that in case one should suffer injury, one may remain to carry on the great work of reproduction. In the foetal coat they are lodged within the belly, but after birth they descend into a bag prepared for them. The *scrotum* is this bag, whose situation is between the hinder extremities. It contains the testicles in two sacs, one appropriate to each. Each testicle is enveloped by two tunics, called *vaginalis* and *albuginea*, obtained from the peritoneum. To each testicle is attached an appendage called the *epididymis*. The *vasa deferentia* are the united trunks of the secretory vessels of the testicle continued from the epididymis. Each vas deferens proceeds to join the *vesicula seminales* of that side to run parallel with it and to terminate near it in the urethra. The *prostate glands* are in the horse two, whose use, like the hollow bodies called seminal receptacles, is not obvious, but probably they dilute the semen.

5741. The *penis* or *yard* is a long body, in one part nearly prismatic, and in another cylindrical. In the usual state the penis is hidden within the *sheath*, which is a prolongation of the skin of the abdomen. The body of the yard is composed of two cavernous flattened portions closely connected, a spongy canal, which is the urethra before mentioned as the continuation of the bladder, and the *glans* or head, which appears in the horse a distinct part. The penis is capable of being distended by means of its blood vessels, which fill its cells to turgidity, particularly under the excitement of lust.

5742. The *generating use of the male organs* is principally derived from the vivifying principle contained in the semen secreted within the testicles, and which the horse is impelled by lust to plant in such a situation as shall produce its effect in the formation of a foetus. In the act of copulation therefore, it appears that the nervous influence acts on the muscular system of the penis, whereby the arteries carry more blood, while the veins are rendered unable from some cause to effect its removal; by which the cavernous cells of the penis become filled, and the member thereby erected; when, from the friction produced by the female vagina, the penis becomes stimulated into a more exquisite sensation, with which the *vasa deferentia* and *vesicula seminales* participate, then by the assistance of the cremaster muscles, the semen and diluting fluids become pressed out, and by a convulsive effort are injected into the generative organs of the mare. The stimulus of the retained semen being now removed, the appetite becomes satisfied, the nervous influence is removed from the vessels, and the penis returns to its ordinary size.

5743. The *female generative organs* are first the *bag* or *mamma*. In the multiparous animals, as the hog, the dog, and rabbit, these bags are numerous, and distinctly placed along the line of the abdomen; but in the uniparous, as the mare, cow, sheep, &c., one bag, situated between the hind legs, contains the secretory of the whole. In the mare there are two *nipples* or *teats*, which form excretory ducts to the milk secreted within. In ordinary cases, the milk is prevented from flowing out by valves, which open on pressure upwards; the colt, sensible of this, is observed to push up the teat with its nose; pigs and puppies with their feet, &c. The milk in different animals has different proportions of certain component parts, but in each it has those best adapted to the animal it is intended to nourish. The *vulva* or *sheath* is the long oval opening immediately below the anus, at the inferior commissure of which is situated the *clitoris*, whose structure is not unlike the male penis. Above this, and rather more internally, is situated the *urethra*, which in the mare is a short membranous canal. The *vagina* is a long membranous canal above the last described parts, capable of great distention; but in its natural state about 9 or 10 inches long and 2 in diameter. It is placed horizontally between the bladder and rectum, and terminates in the neck of the womb. The *uterus* (fig. 618 p) of the mare is very dissimilar to the human, being not an uniform bag; but having a body and two branching *horns*, in which, in the multiparous animals, the young are lodged. The extremity of each *cornua* has a small concealed tube attached to it called the *fallopian tube*, and a little beyond are seen the oval oblong bodies called *ovaria*, (fig. 618 g g).

5744. *Conception, pregnancy, and evolution of the foetus.* *Oestrus*, *heat*, or *horsing* is in animals not constant, but returns at such periods that the evolution of the foetus consequent on it shall take place at the most convenient season of the year. The horsing of the mare produces an inflammation in the vagina and vulva, from whence are ejected what are termed the heats. In this disposition all the parts unite, and when by the injected semen pregnancy has been produced, a vesicle from the ovary enters the fallopian tubes; and by this means becomes deposited in the womb to be nourished into maturity. In its residence within the womb, it is covered with expansions from the neighboring parts; and it derives its nourishment from a communication with the mother by a fleshy tube called the umbilical cord, and thus situated, it swims within a fluid called the liquor amnii: so circumstanced, the foetus continues to grow, until the distention it occasions, becomes too great for the capacity, when the muscular fibres of the uterus, powerfully assisted by the diaphragm and abdominal muscles, contract, and thus force both the foal and the membranes into the world.

5745. The *new born foal*, on its entrance into active life, finds its organs of immediate necessity in a full state of capacity. Unlike the infant, it is far from indigent, but can run and perform the common phenomena of an animal with dexterity and ease. Its powers are however not sufficiently developed to enable it to live independent: it has therefore a necessity for seeking support from the mother, from whose person it derives its food in the form of milk; and it may therefore be now considered in some measure as carnivorous. Gradually it becomes fitted to perform all the more matured functions, and when fully able to counteract its own wants, it sympathises only with itself; when the parent's care being no longer necessary, lactiferous secretion ceases, her generative organs prepare anew for the same great work, and she again feels oestrus or heat.

5746. The *period of gestation* varies in different mares, one hundred and two mares were observed by Tessier, of which 3 foaled on the 311th day, 1 on the 314th, 1 on the 325th, 1 on the 326th, 9 on the 333th, 47 from the 340th to the 350th, 35 from the 350th to the 360th, 21 from the 360th to the 377th, and 1 on the 394th day: which gives a latitude of 83 days in the time of gestation.

SUBJECT. 15. *The Foot.*

5747. The *feet of the horse* present in their united functions a series of *springs* with great complexity of structure. An unreflecting observer considers only the horny box, and perhaps attaches as little merit to its mechanism, as he would to a well turned wooden leg of a man. But a little examination will convince him that all the complexity, all the admirable mechanism displayed in the assemblage of four fingers and a thumb, are here concentrated within this horny box and its appendages. As the parts which compose the hind and the fore feet do not materially differ, a description of one foot will serve for the whole.

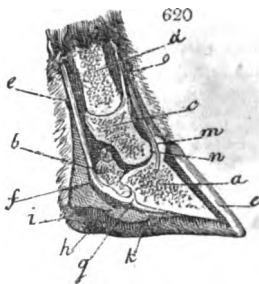
5748. On examining a perpendicular section of the foot and pastern (fig. 620), there appears the coffin bone (a), the navicular or nut bone (b), the coronary or little pastern bone (c), the larger pastern

bone (d), the back sinew or great flexor tendon of the foot (e), the same tendon aliding over the navicular bone (f), its termination or insertion into the bottom of the coffin bone (g), the elastic matter of the sensible frog (h), the insensible or horny frog (i), the horny sole (k), which includes the parts of the sensible foot; the outer wall of the hoof (l), the elastic processes (m), the attachment of the extensor tendon to the coffin bone (n), and its attachment to the coronary bone (o), which completes the section.

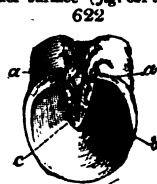
5749. *The coffin bone* (fig. 620 a) adapts itself to the form of the hoof, or rather is adapted by nature to this eligible form. The eminence in front receives the insertion of the tendon of the great extensor muscle of the foot, whose upper attachment is to the humerus or arm bone where it is fleshy, but as it passes onwards, it becomes tendinous, expanding over every joint, both to prevent friction, and to embrace and give attachments to each bone, by which a simultaneous movement of the whole limb is made. In the hinder limb, this extensor and its two lesser adjuncts arise from the tibia and in part from the femur. To the sides of the coffin bone are attached the lateral cartilages, and around its surface are marks of the attachment of the laminated substance.

5750. *The coronary or small pastern bone* (c), articulates with the coffin at its posterior part, and articulating also with both these is the *navicular or nut bone* (f), whose attachments to them are effected by ligaments.

5751. *The hoof is conical*, or rather, as Clark observes, slightly truncated, and is a secretion as well from the vascular parts of the foot as from the skin, as our nails are from the portion of skin called the quick. The structure of the hoof is firm and fibrous; externally plane and convex, but internally concave and laminated. The *quarters* are the lateral parts. As the horn approaches the heels it becomes soft, and is reflected inwards. The heels are parted by the *horny frog* (fig. 621 b), and without the frog on each side, the hoof infects its fibres to form the bars which are seen on the under surface (fig. 621 c).



In a healthy foot (fig. 621.) the heels are round, wide and smooth (a a), the frog fully expanded (b), the bars or binders distinct (c), no corns in the usual angle (d), the sole broad, and concave (d). In a diseased foot (fig. 622.), the heels are high and drawn together by contraction (a a), the frog narrow and filled with fissures from contraction and thrush (b), and the sole greatly shortened in its transverse diameter which is morbidly counterbalanced by the increased heights in the truncated form (c). When the hoof is removed, the *sensible or fleshy sole* (fig. 620 k), above which it immediately lies, presents



itself, covering the whole of the horny sole, except so much as is taken up by the *sensible frog* (k). This part is exquisitely sensible and vascular, and thus we learn why injuries to it from punctures, produce such serious effects; and why very slight pressure from contraction of the hoof gives so much pain. The sensible frog and the sensible sole form the insensible frog and sole; but when from pressure, too much moisture, or other causes, the sensible frog, instead of forming horn, secretes pus or matter as in thrush, the structure of the whole becomes injured, and the horny frog, thus losing its support, gradually wastes and decays. It is therefore evident that no thrush can be entirely harmless, as is erroneously supposed. Above the sensible frog and sole, is the great flexor tendon, or back sinew, inserting itself into the vaulted arch of the coffin, (fig. 620 c.) This important tendon arising from its parent muscle above the knee, whose origin is taken from the humerus and ulna, in its passage unites with an assistant flexor, but which latter is principally distributed to the pastern bones; while the *perforans*, so called because it is perforated by the assistant flexor tendon, is inserted into the vault of the coffin. In the posterior extremities the attachments of these two leading flexors, and a smaller lateral one, are from the femur and tibia.

5752. *The sensible laminae.* Around the surface of the coffin bone, it has been noticed that there are linear indentations to which about five hundred semicartilaginous leaves are attached. Each of these is received between two of the horny lamellae which line the interior of the horny hoof: and when it is considered what a vast surface of attachment is formed by these means, the strength of the union will not be wondered at. No violence can separate these parts, and their use, as so many springs to support the actions of an animal, at once weighty, strong, and extremely agile, must be apparent. The vessels and nerves of the foot are derived from the metacarpal arteries, veins, and nerves, which pass behind the pastern, when the main trunks divide to proceed to each side of the foot, and are ramified from thence throughout. It is a division of the metacarpal nerve on each side of the lesser pastern, or of the larger, as occasion suits, which forms the *nerve operation*, now in vogue as a remedy for founder.

SECT. V. Of the Diseases of the Horse.

5753. *The diseases of the horse* are as numerous and as important as his complicated structure and the artificial state of his present mode of life would lead one to expect. Until of late the treatment of these diseases was confined to the hands of ignorant farriers, presumptive grooms, or shoeing smiths; and the fate of the animals was commensurate with the wretched treatment they were subjected to. The establishment of a school for the veterinary art, has disseminated an improved practice, and spread improved practitioners throughout the country; and we would earnestly recommend an application to one of established reputation in all cases of difficulty and danger. But as it is not always that such a one is within reach, to enable the agriculturist to have in his own hands the means of informing himself, or of being a check on others, we submit a concise view of the diseases of the head, neck, trunk, and extremities, preceded by some general observations.

SUBJECT. 1. General Remarks on the healthy and diseased State of the Horse.

5754. *Condition of horses.* Being in condition, in stable language, signifies not only perfect health internally, but such an appearance externally, as the philosopher would call unnatural, or at least artificial: while the amateur considers it as an essential requisite to the other qualities of the horse. This external condition is denoted by a sleek, short, shining coat, with a degree of flesh neither bordering on fatness, nor emaciation. Even in this sense of the term, *condition* must be varied according to the uses

of the animal. In the cart horse, provided there be sleekness of coat, looseness of hide, sound wind, freedom from grease or swelled legs, with good digestion; a fulness and rotundity of bulk, instead of detracting from his beauty or impeding his exertions, will add to the one and assist the other. In the coach horse, the hackney, the hunter, and the racer, a different condition is expected, varying in different degrees from that of the cart horse. In both cart horse and racer, it is equally necessary that the various internal organs should be in a state to act uninterruptedly for the benefit of the whole: but in addition to this, it is necessary to the racer, that the greatest possible quantity of animal fibre should be condensed into the smallest possible bulk; and that the absorption of all useless fat and other interstitial matter should be promoted by every possible means, as essentially necessary to unite lightness of body, with full strength and elasticity. It is in the attempts to produce such a state in its full perfection, that all the *secrets of training* consist: but whether a total departure from natural rules, by unnatural heat, deprivation of light, stimulating food, restraint from water, and excessive clothing, are best calculated to promote it, admits of much doubt; and it is to be observed that the dawn of reason and science appears to be shining through the crevices of these darkened casements; for even at Newmarket the system has lately much relaxed from its artificial rigor.

5755. *To bring a horse into condition*, not only should the purposes he is intended for be taken into account, but also his previous state. If he be taken up from grass with much flesh on him, it is evident that what is required is to remove the soft interstitial matter it may be supposed he has gained by green food, and to replace it by hard flesh; and also to produce a sleekness of coat and beauty of appearance. To accomplish these ends, the horse should be accustomed to clothing and the full heat of the stable by degrees only; and also by degrees only to the meditated change of food; which is best done by mashes. In two or three days a mild dose of physic may be given, during all which moderate exercise only should be allowed, as walking, but which may be continued two hours at a time. After the physic has set, begin to dress his coat, increase his exercise and his food, and accustom him to an increase of warmth. In four or five days time again mash him for two days, and give a second dose of physic, a very little stronger than the first. (5875.) After this, still further increase his warmth, his exercise, and his food, by which his belly will be taken up, his flesh will harden, and his coat will begin to fall. A third dose of physic, or urine balls, &c. are only necessary in the training of hunters, &c. and even in these, a gradual increase of exercise, rather long continued than violent, with proper food, will effect the end, if not so quickly, more beneficially to the animal. *To bring a lean horse into condition*, a somewhat different plan should be pursued. If from grass, still mash him for a day or two, by no means stint him in his water, and with his mash let corn be also soaked. If corn be steamed or malted, it will produce flesh sooner. But even here, give the horse moderate walking exercise, and if he be not too much reduced, add a mild dose of physic to prevent his heels flying, or his getting hide bound by the increased food; but if great emaciation forbid the physic, give him nightly an alternative. (*Vet. Pharm.* 5881. No. 1.) As his appearance improves, gradually harden his food and increase his exercise.

5756. *Diseased condition of horses*. What has been already said relates to that alteration from one state to another, neither being an unhealthy one, which custom has rendered necessary; thus a man in training for running or fighting, and a man out of training, are both considered equally healthy. But there are circumstances that produce a *morbid state of condition*, different from all these. It is common to hear persons say "my horse is sadly out of condition, and I cannot tell either what is the matter with him, or how to get him into better case." Various are the causes that may produce this: a sudden alteration of the food, or temperature, or of habits altogether, may become a cause. Removing a horse from grass to a heated stable, full feeding, and hard exercise will often do it: therefore these changes should always be gradual. Bad food, as mow-burnt hay, musty oats, beans, &c., likewise mineral waters, foul air, &c., are frequent causes. Diabetes, or profuse staling, is often brought on by these means, and the condition of the horse becomes greatly reduced. It is requisite, therefore, to enquire whether any of these errors are in existence, and to immediately remove them: but it often happens that the stomach has become relaxed and the hide become bound; neither of which readily remove, even though the original evil may be amended. When the relaxed stomach has produced lampas, treat the mouth as described under that disease (5771.), but the stomach itself must be principally attended to. First mash and give a dose of physic; after it has set, commence the treatment, if the horse be of a full habit, by a moderate bleeding and a nightly alternative (*Vet. Pharm.* 5881. No. 1. or 2.) But if he be not in full, but in low flesh, commence by a daily tonic, (*Vet. Pharm.* 5882. No. 1. or 2.) which will gradually remove the swelling within the mouth, and loosen the hide. A sudden cold applied to the skin often brings on a want of condition with surfeit. In which cases bleeding, nightly alternatives (*Vet. Pharm.* 5881. No. 1. or 2.) with or without an assistant dose of physic, as the habit of the horse may require, constitute the proper treatment. Worms form another cause of morbid condition which are to be removed as described (5809.). *Excessive fatigue* is also productive of a bad state of condition, which often proves very obstinate. Turning out to very good grass is the quickest cure, and when that is impracticable, soiling in the stable, or feeding with carrots, parsneps, beet root, &c. will be food restoratives; as medicines give tonics daily, (*Vet. Pharm.* 5882. No. 1. or 2.) It will be only necessary to add, that in considering the state of a horse's condition, the effect is apt to be mistaken for the cause, and the symptoms for the disease. Hide bound and lampas are not in themselves any thing more than effects, or symptoms; the former being common, and the latter being always dependent on a deranged state of the stomach: both are therefore to be treated accordingly. Exactly the same will apply to all the other symptoms of morbid condition.

SUBSECT. 2. Inflammatory Diseases of the Horse.

5757. *The inflammatory diseases of the horse* are numerous, but his fevers are few; a febrile state being generally brought on by the inflammation of some important organ. Inflammation may be considered as general or diffused, and local or confined, and both seem to arise from an affection of the blood vessels, and perhaps from a peculiar state of the blood itself.

5758. *General or diffused inflammation* constitutes fever or extensive inflammatory affection, and appears to consist in an increased action of the heart and arteries, accompanied with an increase of heat. In some instances where the fever is purely symptomatic, and dependent on the inflammation of some important organ, as of the lungs, or the intestines, the circulation appears retarded rather than increased, from interruption arising to its passage through the heart.

5759. *Local or confined inflammation* is also dependent on an affection of the blood vessels, but confined principally to the blood vessels of the part affected. It is tokened by redness in the skin, tumor or swelling, heat and tenderness, with pain. Inflammations, both diffused and local, are brought on by excitements, such as over-feeding, excessive heat, the reaction produced after cold, and the reaction produced by inordinate exertion. Those more exterior, arise from injuries, the application of im-

proper substances, &c. Inflammations terminate in various ways; but it is to be remarked, that in consequence of the very large circulatory system in the horse, his febrile affections rage higher, and terminate sooner than in man. The usual termination of inflammatory affections in the horse, are by resolution, effusion, suppuration, and gangrene. Schirrus is not at all a common termination of inflammation in the horse.

5760. *Inflammation of the brain (phrenitis), brain fever, phrensy fever, staggers, mad and sleepy.* There are few diseases more likely to be mistaken by inexperienced farriers than this; it is not to be wondered at, therefore, if indifferent persons should be led into error by it. It appears in two forms, a violent frantic one, and a sleepy lethargic one, and the latter appearance is also common to a disease, not dependent as this is, on idiopathic inflammation of the brain; but on a paralytic affection of the stomach, and thence it is called stomach staggers. This latter affection, however, may be distinguished from the former by attending to the color of the eyelids, nose linings, mouth, &c., which 'in stomach staggers are usually more yellow than red: whereas in sleepy staggers, they are more red than yellow. Inflammation of the brain shows itself in general cases by disinclination to food and motion, drowsiness, accompanied by a heaviness and closing of the eyelids, with moisture and redness of them; and also of the linings of the mouth and nose. Sometimes these symptoms increase until the horse becomes comatose, and after a few frightful struggles, he sinks to rise no more. In these cases the pulse is apt to be oppressed instead of increased. But most frequently after the first stages he becomes furious, plunges about, and is vicious to himself and others, approaching to a state of madness, in which state he continues till he sinks from his own exertions, when he rises again to renew his violence.

5761. *The causes of staggers may be various:* the immediate are either an original accumulation of blood within the brain, or the translation of the inflammation of some organ to the brain: as a remote cause it is often brought on by too full feeding, without sufficient exercise, and particularly in horses at one time working very hard, and at another suffered to remain inactive; but which horses, whether used, or not, are equally fed. Sudden cold, violence, &c. may bring it on.

5762. *The treatment of staggers* should be begun by abstracting a very large quantity of blood promptly, by opening both jugulars, and letting the horse bleed to the amount of ten or even twelve quarts; repeating the same until the delirium ceases. After the first bleeding, back-race, throw up a laxative clyster (*Vet. Pharm.* 5895.), blister the head, promote a current of free air in the stable, and treat altogether as directed under other febrile affections.

5763. *Locked jaw, stag-civil, or tetanus,* arises from cold, excessive fatigue, sometimes perhaps from worms, but more often from a wound of some part, as pricks in shoeing, &c. Such wound is seldom in a recent state; but after two or three weeks' continuance, sometimes after it has healed even: it follows docking, gelding, and nicking frequently; and is preceded by a flabby unhealthy state of the wound. It appears as an affection of the brain, which transmits its morbid irritation, particularly to the nerves attached to muscles, by which they become cramped, or may be considered as in a high state of action, giving the horse a peculiar look of energy, as though immediately stopped from full speed; with his nostrils extended, his head raised, and nose carried forward; his legs straddle wide, and his tail is cocked and quivers, as after violent exercise. The jaws will now be found, if not closed, yet nearly so, when he is called jaw act.

5764. *The treatment* is not often successful, but, however, it is sufficiently frequent that it is so, to deserve the utmost attention. Blaine informs us that enormous bleedings have succeeded; but he places his principal dependence on the application of cold by the means of ice, or of constant dashing with cold water, with an active blister applied the whole length of the spine. Balls of camphor and opium, to the amount of two drachms of each, may be given every three hours. If any room remains in the mouth, the ball may be passed up by means of a stick, or it may be given as a drink by means of a syringe; and even when the mouth is entirely closed, he informs us we may give a drink by the nostrils. Moorcroft used cold also. Fearon, on the contrary, has experienced benefit from a bath, heated to ninety degrees, and kept at that temperature for three hours. White recommends camphor and opium; Wilkinson of Newcastle has been very successful by keeping up heat and stimulus over the skin in general, by means of newly stripped sheep skins put on hot. Perhaps if the body were previously rubbed with oil of turpentine one part, and common oil two parts, it might assist Wilkinson's plan. When locked jaw arises from nicking, it might be prudent for a veterinary surgeon to dissect down on the nerves of the tail, and divide them; and when from nicking, it would be advisable at once to cut off another portion of the tail, which practices in both instances would afford a moderate chance of saving the animal. It is necessary further to remark, that it is of great consequence that the bowels be kept free from feces, by raking and clysters. With regard to the latter they are very important in this disease, as a medium, commonly the only one, of giving support. A horse has been kept alive on nourishing clysters alone, for seven or eight days. (*Vet. Pharm.* 5897.)

5765. *Catarrhal fever, epidemic catarrh, influenza, distemper, cold, morfoundering, &c.* These names apply to one common disease, which often in rainy, variable seasons, appears as an epidemic, and affects thousands of horses at once. It is observed to be particularly prevalent in this form in the spring of some years, more than of others. It is not contagious, like the more malignant form, but is brought on as an epidemic by the same causes being applied to nearly all subjects alike; which are alternations of heat with cold, moisture and dryness, &c. In crowded cities and large towns it is more prevalent than in more open situations, and it is more frequently found in the young than in aged horses. Where it does not exist as an epidemic, it is brought on by an accidental cold taken. It is of great consequence to distinguish it from pure inflammation of the lungs, with which it is very apt to be confounded; and which mistake is often a fatal one, from the treatment being in some essential particulars different. Inflammation of the lungs commences by a short cough, without much other disturbance to the health, than the pain it gives the horse to cough, but which is often so considerable as to make him stamp his feet while coughing. If a horse in the distemper coughs early, it is not a hollow, harsh sounding, and distressing cough of this kind; if he expresses uneasiness, it is principally from a sore throat, which is very common in distemper, but by no means common in pneumonia. The sore throat in distemper gives the horse a disposition to refuse his food, or he chews it and lets the quid fall without swallowing it. He refuses water, particularly if it be placed on the ground; his cough is quick, short, and usually sounds more moist than harsh and dry; but though common, this is not invariably the case; his eyes are heavy and moist, his breathing is quickened, and his ears and legs are alternately hot and cold. His nose on looking into it is redder than usual, and sometimes his glands, as well submaxillary or jaw glands, as his parotid or vives, are tumefied. On the second or third day excessive weakness comes on; the cough becomes more painful, the pulse is quickened, and the nose begins to run. After which the horse either runs off the disease by this suppuration, or it goes on to destroy him by the height of the fever, and degree of weakness produced, or by suffocation from water in the chest. Now and then, although recovery takes place, an obstinate cough is left; and in a few cases the disease terminates in glanders.

5766. *The treatment* may in some cases be cut very short; for as in almost every instance a shivering fit begins the disease, so when many horses are in a stable, and the disease is very prevalent, those who have not been attacked should be watched, and the moment such an attack does take place, give of sweet spirit of nitre, or when not at hand of spirit of hartshorn, an ounce, in a pint of sound ale. Exercise the horse briskly, then well hand rub him, clothe him warmly; and it is more than probable that the disease will be cut short. But should it proceed, or should the disease have gone on unobserved to the appearance of the symptom detailed, begin by bleeding moderately, if the horse be not already

weak; or if there have not appeared the running of matter from the nose. If there have, the bleeding had better be dispensed with, unless the fever appear, from the quick full pulse and redness of the inner surface of the nostrils and eyelids, to be still so considerable as to require it; in which case we must not be deterred from one moderate bleeding; and which, if the febrile symptoms do not abate, may be even repeated. It will, however, in general cases, be advisable to avoid bleeding after the second day of the attack, or after the running has appeared from the nose, or after considerable weakness has come on. In all cases a very cool temperature is essentially requisite: hot stables, or hot clothing are very pernicious; but particularly the former. A hood is not improper over the head, because it encourages the running to make an early appearance; and for this reason a warm mash may advantageously be hung round the neck three or four times a day. Before the running commences, give night and morning the fever powder (*Vet. Pharm.* 5909. No. 1. or 2.) in a mash or drink: after the running has come on, or as soon as the weakness has become considerable, give night and morning either of the fever drinks. (*Vet. Pharm.* 5910. No. 3. or 4.) Malt mashes, when the weakness is great, are proper; at other times bran mashes with plenty of chilled water are best. To relieve the throat, rub the outside with mild liquid blister, (*Vet. Pharm.* 5894.), and if the weather be warm enough to allow it, two or three hours turning out in a field each day is proper. Green meat in the stable, when it can be procured, should likewise be given.

5767. *Malignant epidemic, murrain, or pest.* Now and then the distemper or influenza assumes a character of uncommon malignance, which is happily not frequent here, but not unfrequent in continental countries, sweeping off a third of the horses and kine, without any means being found sufficient to arrest its progress. In these cases it is found highly contagious, attacking almost all the horses as well as cattle within its sphere of action, or which communicate with each other. Dr. Laidard, and Osmer, English writers of established reputation, noticed the appearances of this disease long ago; and their descriptions are not different from the milder kind noticed (5765.) but in degree. The throat is intensely sore, and the mouth ulcerated; the glands of the head swell, and sometimes these and other parts suppurate and burst. The matter from the nose is bloody, and the stench intolerable; the weakness is also peculiarly great, and shews itself early.

5768. *The treatment recommended by Blaine is the early use of malt mashes; even ale is indispensable.* Green meat should be allowed and a very cool stall is necessary, having a free communication with the open air. As medicine, three doses are necessary, every day, of the malignant epidemic fever drink (*Vet. Pharm.* 5912.); half a pint of yeast with a pint of ale has been given, with good effect, three times a day; also, to prevent the infection from spreading, fumigate the stables and all the outhouses with the preventive fumigation (*Vet. Pharm.* 5913.)

SUBJECT. 3. Diseases of the Head.

5769. *Epilepsy, megrims, sturdy, or turnsick,* are epileptic attacks of greater or less violence, and which are apt to be confounded with the accidental strangulation that sometimes takes place, from a collar too tight, or from driving a horse hard up hill, &c. The epileptic fit makes its appearance by a sudden stop; if the horse be in action he shakes his head, looks wild and irresolute, but after some time he proceeds; when more violent, he suddenly falls down, is convulsed, dungs and stales insensibly, and remains some time before he recovers. This disease, like staggers, is generally the consequence of too full a habit; and is, therefore, best relieved by bleeding, and a more moderate diet; and, where it is convenient, a run at grass should be allowed to alter the habit.

5770. *The diseases of the horse's eyes* are not numerous, but they are very destructive. The principal are ophthalmia and gutta serena.

5771. *The ophthalmia, lumatic, or moon-blindness,* is a very peculiar disease among horses, affecting their eyes generally about their full growth, but sometimes later, and seldom earlier. It is but little known among mules and asses, and unknown in oxen and sheep. It does not, however, appear to be a disease natural to the horse, as wild, or even horses little subjected to artificial restraints, are not observed subject to it. But among others, it is become so common as to have the tendency handed down in the breed; the progeny of some stallions being more prone to it than others. It is often very sudden in its attack, the eyelids being found swelled and almost closed to avoid the light; they are also very red within, and the hair is half drawn over the surface; the tears flow down the face perpetually, and the whole head is hot; now and then these appearances come on gradually. The suddenness of the attack makes the complaint to be attributed to accident, as blows, hay seeds within the eye, &c., and it is frequently difficult to get the owner of such a horse, to believe that a constitutional attack, as it usually is, can come on so suddenly. Sometimes as it comes on, so it goes off as quickly, the eye from being opaque and milky, in twenty-four hours becoming clear and almost well. When such an attack has taken place, even if nothing be done, the horse sooner or later amends; and the eye or eyes, for it is sometimes one and sometimes both that are so attacked, become again clear and well, and remain so an indefinite period, from five or six weeks to as many months. Another attack, however, sooner or later follows, to which others succeed, each leaving increased milkiness on the outer coats, and some dimness within the pupil, either speck-like or diffused; and finally the horse becomes blind from *cataract*. When one eye goes blind totally before the other, it is often a means of preventing the future attack on the remaining one; which has given rise to a custom of putting out one eye to save the other, and which has succeeded. As this is a constitutional disease, brought on by artificial habits, as over exertion, close unhealthy confinement, and heating food; so it is clear the abstraction of all these are necessary to remove the complaint, and to prevent a recurrence; but particularly the close, dark, and unventilated state of the stable should be attended to, as well as the removal of the litter, which retains the volatile alkali of the urine, and irritates the eyes most injuriously. The food should be mild and cooling, and the exercise moderate, but long continued. Under the height of the attack, however, rest is advisable, with moderate light, which may be still further moderated by keeping over the eye or eyes a thick cloth wet with goulard water. (*Vet. Pharm.* 5906.) Sometimes one quarter of vinegar to three quarters of water has been found a useful application, and whichever is used, the eyes and eyebrows should be kept continually wet with it, which by exciting evaporation will keep the part cool. A seton may be introduced under the eye or jaw. In some cases, blistering the forehead or cheek is found useful; but in every instance bleeding is proper, which should be repeated until the disease lessens. When the horse is very full and gross, physic and alteratives assist the cure. When blistering is used in any part near the eye, the greatest care is requisite to prevent the blistering matter from being rubbed into it.

5772. *Gutta serena or glass eyes,* so called from the peculiar glassy appearance of the eye, arise from a paralysis of the optic nerve. As the eye is not materially altered in appearance, a horse often becomes blind without its being noticed, until his cautious stepping, quick motion of his ears, &c., give notice of the case. On examination it will be found that the pupil remains dilated, however great the light, and the eye is irrecoverably lost. In the very early stages, blisters to the forehead and stimulants to the eyes, (as *white vitriol a drachm, water four ounces,* may be tried, but with faint hopes of success.

5773. *Pole evil.* This complaint commonly requires the attendance of an experienced practitioner; but the prevention is often in the power of owners, and others about horses; and to this point we shall particularly direct their attention. Pole evil is commonly the effect of accident. Repeated small blows of the manger, or continued pressure from hanging back on the halter, &c., will, if not remedied, produce swelling at the nape of the neck with some tenderness. In this early state, if the collar be removed and the part be kept continually wet with vinegar and water, the swelling will often disperse; but if, in spite of this, it proceeds to supuration, let a vent be made for the matter by a seton (5698) so that it may readily flow out. Introduce nothing healing, but encourage a free discharge, and it may

yet heal at once. When such is not the issue, the disease attacks the ligaments; sinuses form, and the matter burrows under the skin and muscles, when a seton must be introduced from the opening above and should be brought out at the bottom: the seton should be then daily wetted with the liquid blister. (*Vet. Pharm.* 5893.) Should this plan fail, escharotics will be required in the form of *scalding mixture*. (*Vet. Pharm.* 5917.)

5774. *Strangles, wyes, or ives*. This disease has been likened to the human measles, because it usually attacks every horse, and most of them at a young period, between three and five years; it is fortunate when it attacks colts at grass, as it seldom occasions inconvenience, and which has led some persons into error by turning their horses out as soon as attacked; but it is not found that stabled horses, thus turned out, pass through the disease more mildly, but the contrary, except the disease exists under its very mildest form. White has conjectured that colts breeding the strangles while at grass, are afterwards exempt from glanders, but this wants confirmation. Prosser has also affirmed, that inoculation by the matter of strangles, is good, because it mitigates the complaint, and renders the horse not liable to any future attack; but the practice has never gained ground: when strangles occurs in the stable, and now and then also in the field, it proves a severe disease, and shews itself under the appearance of a cold, with cough, sore throat, and swelling of the glands under the jaws, or behind and under the ears. Sometimes there is not much external swelling, and the tumors break inwardly, and nature effects a cure; at others they break outwardly, and the disease runs off that way, and sometimes the swellings disperse either by nature or art, which breeders think unfavorable, as they suppose it renders the animal liable to a future attack, but many so treated, pass the remainder of their lives without more affection.

5775. *The treatment of strangles*. When the swelling lingers, and neither comes forward or recedes, poultices are preferable to fomentations, which, by leaving the horse wet, promote evaporation and produce cold. Peel recommends blistering the part, as the best means of promoting suppuration. The horse should be kept very cool, and bran mash with warm water should be his principal support, unless the complaint last long, and produce much weakness, when malt mash should be substituted; bleeding is only advisable when the early symptoms are violent, as heaving at the flanks, extreme soreness of throat, with much swelling around it, and considerable cough, in which case, bleeding and fever medicines are proper.

5776. *Vives, or ives*, is supposed to be a relic of the latter complaint, and it does appear now and then that after the strangles, the parotid or vive glands do remain enlarged (5794.), which occasions the disease in question; resolution may be attempted by mercurial frictions, suppuration should be avoided, otherwise the gland may be destroyed.

5777. *Diseases of the mouth, lampas*. All horses, but particularly very young ones, are liable to enlargement of the rugæ or ridges of the palate, dependent not on any local disease confined to the part itself, but occasioned by an affection of the whole passage of the mouth, throat, and stomach. It is usual to attend to the part only, which is scarified or burnt to little purpose, when a mild dose of physic, or gentle alteratives, would prove more certain expedites; to which may be added rubbing the part with bay salt, or with vinegar.

5778. *Bridle sores*. When the bit in colt breaking, or in hard pulling horses, has hurt the bars, care is requisite to prevent the bone becoming carious. Touch daily with ægyptiacum, and cover the bit with leather, unless total rest can be allowed.

5779. *Diseases of the teeth* are fully treated of under the anatomical description of the bones. (5636.)

SUBJECT. 4. Diseases of the Neck.

5780. *Fistulous withers* are brought on usually by pressure from a saddle with too low or narrow a tree, and what has been said both with regard to prevention and cure on the subject of pole evil, applies here also. (5668.)

5781. *Sore throat* is common to horses in colds, in influenzas, and in strangles. (5765. 5774.) In every case, the horse finds great difficulty in reaching every thing that stretches his neck downwards or upwards; his water therefore should be held to him, and his hay should be pulled far him: omission of these services greatly aggravates the sufferings of horses laboring under sore throat.

5782. *Swelled neck*. A very serious swelling sometimes follows on bleeding with a rusty or poisoned lancet, or fleam, and sometimes from causes not apparent. (5878.)

SUBJECT. 5. The Chest.

5783. *Inflammation of the lungs* is a disease to which the horse is peculiarly liable, as we might *a priori* suspect, from the vast dimensions of his circulatory system, and the vast alteration from a natural state to which we subject him, and thereby increase his pulmonary circulation.

5784. *The causes* are these deviations remotely, but the immediate attack is generally brought on by sudden cold, acting on a heated surface, and thus it is that knackers and collarmakers in frosty weather expect a glut of horses that die from this disease. Hard riding is a very common cause, and high feeding also; it often commences slowly, a hard dry cough has been slightly noticed, but occasioning no alarm for two or three days: gradually, however, the cough appears to give the horse pain; he occasionally shivers, and his ears and feet feel colder than the rest of his body; he heaves at the flanks, and the lining of his nose is inflamed, and his eyelids also: the appetite now becomes affected, and although there is not much apparent pain, except when the horse coughs; yet there is much anxiety of countenance present. The pulse is usually small but quick; if in this state the horse be taken out and exercised quickly, it is almost always fatal to him: it likewise happens that this complaint is sometimes mistaken for distemper, and from a fear of profuse bleeding, the only remedy that is to be depended on, is omitted, and the horse is lost. At the veterinary college, in these cases, a small dose of aloes is given every six hours, and after being bled and rowelled, the horse is turned out in the open air; and it is affirmed that many recover from this treatment. Certain it is that the stable in which a horse is placed in this disease can hardly be too cool; but when entirely turned out, his feet and legs cannot conveniently be hand-rubbed, or bandaged up to promote circulation; neither can we blister a horse when turned out, so conveniently; and on blistering we depend as the second source of cure.

5785. *The treatment* is to be commenced by attempts at lessening the action of the arterial system by early and large bleedings, as seven or eight quarts from a large horse, and which should be repeated in five or six hours if he be not relieved in his breathing. Immediately rub into the brisket, on the chest, and behind the fore legs, the blister (*Vet. Pharm.* 5890. No. 1.). Give half a dose of physic, and assist it by mashes and warm water; which, if not readily taken, horn down. Back-rake also, and throw up the laxative clyster, (*Vet. Pharm.* 5895.). Avoid all exercise, clothe moderately, allow a free circulation of cool air through the stable, and rub the legs frequently, and when not under this process, keep them bandaged up to the knees with hay-bands or woollen cloths. The terminations of this complaint are various. It is not uncommon for the horse to appear better, to eat and to drink, and to excite every hope of a perfect recovery; but on some sudden exertion he falls down and expires. On examination after death, it is found that effusion of a large quantity of serous fluid has taken place in the chest.

5786. *Thick wind* is another termination of *pneumonia*, by leaving the bronchial passages charged with coagulated blood. Moderate exercise and soiling in the stable with mild mercurial physic, form the best modes of treatment; but it frequently happens that the cough resists all these, and terminates in broken wind.

5787. *Roaring is also a termination of pneumonia*, in which case the lungs are not affected, but coagulated blood, under the name of coagulable lymph, remains in the trachea or windpipe, and obstructs the free passage of the air; by means of which the roaring noise is made. It is in vain to expect a cure: blistering the throat sometimes slightly relieves it.

5788. *Chronic cough is also a termination of pneumonia*, and appears dependent on a peculiar irritability the disease leaves in the bronchial passages, which are found afterwards incapable of bearing any sudden alteration of temperature: thus horses with this kind of cough are excited to it as soon as the stable door opens, and by every exertion, by drinking, by eating, and, in fact, by any thing that alters the situation of the body, or is new to the part. But besides pneumonia or inflammation of the lungs producing it, it is often brought on likewise by gross feeding, which, weakening the stomach, impoverishes the blood, and thus injures the lungs which are fed by that blood. Worms also by the same means are a cause of chronic cough. It is thus that we expect to derive benefit by mediocrity acting on the stomach. Green food is often found useful, but particularly carrots. The hay should be excellent in quality and small in quantity; and it will be found that soiling in the stable, but particularly a course of carrots, forms a better plan of treatment than turning out. If worms be suspected, treat as under that head. (5809.) Formulas of chronic cough balls are seen in the *Vet. Pharm.* (5900.)

5789. *Broken wind is also sometimes brought on by pneumonia*, and sometimes by occult causes. It is often occasioned by over-exertion after full meals, in which the lungs become permanently weakened, perhaps ruptured in their air cells. Inexperienced persons find some difficulty in detecting broken wind from other chest affections, as chronic cough, occasional colds, &c. &c.

5790. *Criteria of broken wind.* The cough which accompanies broken wind is a short deep hollow grunting noise, and the short grunting expiration is peculiarly excited by turning a horse quickly round, striking him smartly with a stick at the same time, which often produces the deep sound without the cough; and which is so significant as never to be mistaken when once heard and attended to: but the principal peculiarity arises from the beating of the flanks, which operate rather by three efforts than by two as usual. In the first, the air is drawn in, in the usual manner, and the flanks fill up as in common; but in the next, the falling of the flanks is by no means natural, for it is not done by a gradual sinking of the sides, but it takes place at once, with a kind of jerk, as though the horse were sighing; and then a third effort takes place by a more slow drawing up of the muscles of the belly and flanks, to press out the remaining air. Broken wind destroys the fecundity of the mare, and hence argues permanent alteration of structure; it is also always incurable, but horses may be rendered very useful that have it, by feeding them very nutritiously, but with their food much condensed in bulk. Little hay should be allowed, and that little should be wetted, water in any other way should be given but sparingly, for which they are however very greedy: from which circumstance, as well as that they are peculiarly flatulent, we learn, that the vitiation of the lungs is either aggravated by the deranged state of the digestive organs; or, which is more probable, that the digestive powers become weakened from the state of the lungs.

5791. *Diseases of the belly.* Inflamed stomach seldom attacks the horse as an idiopathic affection, but it is not infrequent for the stomach to become inflamed by mineral poisons as well as rendered inert by vegetable ones.

5792. *Mineral poisons inflame the stomach* acutely, and produce excessive distress, and cold sweats; the animal lies down, rolls, gets up again, looks short round to his ribs, stamps with his fore feet, and his pulse beats quick and short. When arsenic or corrosive sublimate have occasioned the malady, a viscid mucus distils from the nose and mouth, and the breath is fetid. When copper in the form of vitriolic salts, or verdigris has been given, to the foregoing symptoms are usually added ineffectual attempts to vomit. Immediately the poisoning is discovered, pour down two ounces of *sulphuretted potash*, in a quart of water, or in the absence of that, an ounce of common potash in the same quantity of water: or when no better substitute is at hand, even strong soap suds are advisable. Mineral poisons have also another mode of acting, and are often received into the constitution, neither by design to do mischief, nor by mistake; but are purposely given as remedies. In this way, both mercury and arsenic are frequently given for worms, glanders, farcy, &c., in daily doses, which, when even of considerable magnitude, occasion for many days no inconvenience: all at once, however, the constitution becomes sulkily saturated with the poison, and although before diffused throughout the blood, it now appears to return and act on the stomach to the great surprise of the owner. In these cases the symptoms are not usually so violent as in the former instance, but they are equally fatal. A similar treatment with the one already prescribed is necessary, and as soon as the first symptoms are abated, give laxatives. In all these cases, large quantities of linseed tea should be horned down, the back should be raked, and clysters thrown up, blood should also be taken away plentifully. As a preventive to this latter mode of poisoning, whenever mineral agents are used, it is prudent every five or six days to stop a while, and then recommence, by which the constitution will part with the previous quantity.

5793. *Salivation is also another mode of poisoning*, and though not equally injurious to the stomach, it often proves distressing, and sometimes fatal. Whenever, therefore, mercurials are given, carefully watch the gums, and as soon as they look red, and the horse quids his hay, give him a mild purge instead of his mercurial.

5794. *Vegetable poisons also inflame the stomach*, but by no means in an equal degree with the mineral poisons; nor is it supposed that it is the inflammation they raise that proves destructive, but by an effect communicated through the stomach to the nervous system. *Digitalis purpurea* or foxglove, *Iarus haccata* or yew, *anemone crocata* or water dropwort, *cicuta virosa* or water hemlock, *phellandrium aquaticum* or water parsley, *conium maculatum* or common hemlock, are all poisonous in a high degree to horses, and may be taken accidentally by the animal as food, or given injudiciously as medicine. *Nicotiana* or tobacco, and the vegetable acid or vinegar, are also poisonous, and are sometimes productive of injurious consequences by over-doses, when intended as remedies. It is little known that a pint of strong vinegar has destroyed a horse. As we cannot remove the matters from the stomach, we must endeavor to neutralize their effects by acids and demulcents, as oil, butter, &c. Thus, when narcotics have been taken, a drachm of sulphuric acid or oil of vitriol may be given in a quart of ale; or six ounces of vinegar, with six of gin, and a quart of ale, may be tried.

5795. *Stomach staggers.* This peculiar complaint, which is even yet but little understood, appears dependent on a particular state of stomach, acting on particular foods; and not on what is taken in, acting on the stomach, as was supposed by Coleman, White, and others. From later communications of White, he also now appears to consider it as originating in "a peculiar state of stomach." Blaine appears always to have characterised it as "a specific inflammation of the stomach." It appears among horses of every description, and at grass as well as in the stable; and there is reason to think it epidemic, as it is prevalent in some seasons more than in others. It may, perhaps, be regarded now and then as endemic also; under which circumstance it appears confined to low wet situations, where long marshy grass is abundant, and where noxious aquatic plants mix themselves with the grasses. When it occurs at grass, the horse is found stupidly dull, or asleep with his head resting against something. This has occasioned the disease to be called the sleepy staggers; and it has often been confounded with the phrenitis or inflammation of the brain. (5760.) In the stable the horse does, and rests his head in the manger; he then wakes up and falls to eating, which he continues to do until the distention of the stomach becomes enormous; for the peculiarity of the complaint consists in the total stop that is put to digestion, and the uneasy feel of the distention consequent to such indigestion appears to deceive the horse, and by a morbid excitement to force him to take in more. In this way he continues eating until the distention prevents the return of the blood from the head, and the animal dies apoplectic, or his stomach bursts with over-distention. More fre-

quently, however, the stomach becomes flabby, inert, and paralytic, and after death presents marks of inflammation towards the pylorus.

5796. The treatment. When recovery has taken place, it has occurred only when the disease has been very mild, and has been assisted by stimulating the stomach into action by purgatives, at once active and invigorating, as an ounce of aloes dissolved in half a pint of gin. When a horse of extreme value is attacked, croton oil might be tried to the amount of 30 or 25 drops in two ounces of tincture of aloes. Warm water in small quantities, or mixed with common salt, should be frequently passed down. Remove every stable, rake, clyster, and hand-rub; and if the determination to the head be extreme, bleed, otherwise avoid it.

5797. Inflammation of the bowels, enteritis, or red colic, is a very distinct disease from the gripes, gullion, or fret, with which it is, however, very apt to be confounded to the destruction of many horses. The peritoneal inflammation of the bowels, the one here treated on, is an affection of their outer covering.

5798. The causes are various. It is not unfrequently brought on by a sudden translation of cold after great heats, as swimming during hunting, or from the removal of a horse from grass at once into heated stables, clothing and hard food; neglected gripes, or long-continued costiveness, excessive riding, and the immediate drinking of cold water, have brought it on. It begins by restlessness, loss of appetite, some uneasiness; the mouth is hot and dry, the inner membranes of the mouth, nose, and eyelids, are often redder than natural. As the disease advances, the pain, before not violent, now increases so as to force the horse to lie down and rise again frequently; and when very violent, he kicks at his belly, or looks round at his sides, pawing his litter very frequently. The pulse is usually small, quick, or hard; sometimes it is more full and small, but always hard. Breathing is quickened, the extremities are alternately hot and cold, but continue longer cold than hot; and the animal is costive: sometimes pain may force away a few hardened balls of feces, but the principal contents are retained. Blaine has given the distinguishing features between this disease and colic, under which head we have stated them.

5799. The treatment must be active and immediate, or a fatal termination may be expected. Begin by abstracting a considerable quantity of blood; from a large horse to the amount of seven or eight quarts; proceed to back-rake, throw up a large clyster of warm gruel. Give by the mouth, if the expense be not considered an object, a pint of castor oil, mixed by means of the yolk of two eggs, with half a pint of broth or gruel. If the expense be objected to, give olive oil instead, following it up in half an hour by a gruel drench, in which six ounces of Epsom salts have been dissolved. A sheep-skin, immediately as it is removed from the sheep, may be applied to the belly, which should first be well rubbed with the stronger liquid blister. (*Vet. Pharm.* 5893.) In four hours repeat the bleeding, if a considerable improvement have not taken place, and if the bowels be not unloaded, give more oil, and clyster frequently, having first back-raked. Avoid exercise; first hand rub, and afterwards wrap up the extremities to the knees. As a clear passage for the dung is found, the symptoms mitigate, and the animal slowly recovers; but he must be fed at first very sparingly.

5800. Inflammation of the inner surface of the intestines is, in some measure, different from the former, which is rather an affection of their outer covering; whereas this is usually confined to their villous surface, and may be brought on by superpurgation from over-strong physic, or from mineral acids being taken in, particularly mercurials, which often exert more influence on the bowels than on the stomach. It differs from the former in the symptoms being generally accompanied with purging; neither is there usually so much pain or uneasiness present, nor such cold extremities; but where from the violence of the inflammation these symptoms are present, bleeding to the amount of three or four quarts is a proper preliminary, but can hardly be with propriety continued. The same stimulants to the outside of the belly should be used as in the last disease; but here, clothing is recommended as well as warmth in the stable, as also hand-rubbing to keep up the circulation in the extremities. Give astringent drink (*Vet. Pharm.* 5883. No. 1. or 2.) with a pint of boiled starch every three hours, and give the same by clyster with two quarts of pot liquor, or tripe liquor, free from salt.

5801. Dysenteric inflammation of the horse's bowels is happily not very common, but now and then appears, and is then called by farriers molten grease; they mistaking the morbid secretion from the intestines, for the fat of the body melted down and passing off thus. But dysentery is a peculiar inflammation of the mucous surface of the intestines, not contagious as in the human, nor epidemic, nor exhibiting a putrid tendency; but is peculiarly confined to a diseased increase in the mucous secretions, yet very different from simple diarrhoea, which is a mere increase in the peristaltic motion, by which the common aliments are quickly passed through the intestines, and ejected in a liquid form by an increase in their watery secretion. Whereas in the dysentery of the horse, the mucous of the intestines separates from them in large quantities; and comes away with the dung surrounding it; but when it does not pass in this way it appears in membranous films like sadden leather, or in stringy evacuations, like morsels of fat floating in water; sometimes there is a little bloody appearance. The usual symptoms of fever are always present, but not in a very high degree.

5802. The causes are cold, over-riding, and not unfrequently acrid substances within the intestines: change of food has occasioned it.

5803. The treatment. In the first stages bleed considerably, and give as the first internal remedy six ounces of castor oil, which will amend the fecal evacuations considerably; afterwards administer the following: powdered *ipeacacuanha*, a drachm; powdered *opium*, a scruple; liquid arrow-root, eight ounces. Should this not check the evacuation, and should it continue as mucous as at first, again give castor oil, and then follow it up by either of the drinks directed for the cure of scouring or looseness. (*Vet. Pharm.* 5883.)

5804. Diarrhoea, or looseness. This complaint originates in an increased peristaltic motion of the intestines with an increase of their watery secretion, and is distinguished from dysentery by the purging being complete from the first, and seldom occasioning much fever or disturbance in the general health, unless exceedingly violent. The stools are merely solutions of the aliment, and unmixed with membranous films as in dysentery or molten grease. It sometimes succeeds to over-strong physic; at others the food enters into new combinations, and forms a purge. Some horses have their bowels constitutionally weak, as lank-sided small carcassed ones, where the mechanical pressure hurries the contents forwards. Salt mashes and sea water will purge horses violently sometimes. It is always proper to encourage warmth in the skin, and to change the food. The change should be generally from one more moist to one less so, as beans, &c. Barley will sometimes stop looseness; malt usually increases it. Buck-wheat is often a check to habitual diarrhoea. Efficacious astringents will be found in the *Vet. Pharm.* (5883.) Repeat either of these night and morning. Give but little water and that little warm.

5805. Colic, flatulent, or spasmodic, called also gripes, fret, or gullion, is an important, because a frequent, disease, and because it frequently destroys either quickly by its irritation, or by its degenerating into the red or inflammatory colic, when improperly treated or long continued. It is usually very sudden in its attack.

5806. The causes of colic are not always apparent. It is sometimes occasioned by intestinal stones, which accumulate to a great size, remaining for years in the cells of the colon until some accidental displacement occasions an interruption to the peristaltic motion. Cold in its various forms is a parent of colic; but under the form of cold water given when a horse is hot, it is most common. In some horses it is so frequent as to become a constitutional appendage.

5807. The distinguishing marks between colic and inflammation of the bowels are gained, according to Blaine, by attending to the following circumstances. In gripes the horse has violent fits of pain, but they remit, and he has intervals of ease. The pain in red colic is more uniform and less violent. In gripes, the pulse is, in general, natural; in red colic it is quicker than natural, and commonly small.

The extremities are not usually cold in gripes; in red colic they usually are. In gripes, the horse attempts to roll on his back, which in red colic he seldom does. There are no marks of fever with gripes, as red eyelids, inflamed nostrils, &c.; but in red colic they are always present. When the complaint has continued some hours it is always proper to bleed to prevent its ending in inflammation: bleeding in the mouth is quite useless. Back-rake, and throw up clysters of warm water, one after another as fast as possible, which often overcomes the irritation. La Fosse recommends a curious remedy, but as it can always be obtained, and has the sanction of long experience, it may be tried. An onion is pounded and mixed up with some powdered savine: in default of which, use powdered ginger. This is to be introduced up the rectum as high as possible, and the horse is to be then moved briskly about. An onion put up the fundament whole has long been a domestic remedy. The following is recommended by Blaine: *spirit of vitriolic ether, an ounce; powdered opium, one drachm; oil of turpentine, three ounces; warm ale, a pint.* He also recommends the following more simple remedy as always at hand: *the expressed juice of two or three large onions, common gin, common oil, of each half a pint; mix and give.* White recommends a pint of brandy, or of gin, with water, as an excellent carminative. Clark, who has expressly written on gripes, extols the virtues of a mixture thus made; which, if it have the qualities he attributes to it, and which there is no reason to doubt, no agriculturist, coach, or post master should be without it: *pimento berry, called also allspice, ground fine, half a pound; spirits of wine, and of water, of each a pint and a half; infuse these together, and keep for use.* Give a quarter of a pint every hour until full relief is obtained; hand rubbing, wiping, or fomenting the bowels with hot water at the time.

5908. *Inflammation of the intestines from wounds in the belly* frequently occurs; and these injuries may happen in leaping over hedges or pale gates, or may be inflicted by the horns of a cow. Sometimes the strong tendinous covering of the belly is ruptured, while the skin remains entire; the gut then protrudes and forces out the skin into a tumor. The first thing to be done is to put the gut back, taking care at the same time, otherwise extensive inflammation follows, to remove any dirt or other matter that may be sticking to it; for which purpose, should it be found necessary, it may be washed with warm water, but with nothing stronger. If the gut cannot be returned, from its being full of air, and the opening in the belly be too small to put it back again, such opening may be carefully enlarged to the necessary size. But if the animal can be thrown upon his back conveniently, a great deal may be done that cannot otherwise be accomplished; after the gut is returned the skin only should be stitched up, and a cushion of several folds of old linen and tow being placed in the wound, it should be kept in its situation by means of a wide bandage rolled round the body, and carefully secured. The animal should then be copiously bled, and have his bowels emptied by clysters. The only food he should be allowed is grass, or bran mash, and that only in moderate quantity. When the distention of the intestines wholly prevents their return, it would be prudent to puncture them with a very fine instrument, and thus to suffer the air to escape, which, although subjecting the horse to the risk of inflammation, is better than the certainty of death by having the intestines protruded.

5909. *Worms of horses* are found, as bots, in the stomach, but which as they attach themselves to the hard insensible part of that organ seldom do harm. Clark fancifully supposes they do good, and devices means for furnishing them when not in existence. The bot is the larva of the *cestus equi*, a fly which deposits its eggs, it is supposed, on the grasses on which horses feed, and probably on parts of the horse himself, from whence they pass into the stomach by the food or by being licked off. Certain it is they get there, are hatched, and there remain hanging to the coats of it by two tentacula, receiving the juices of the masticated food as nutriment. After a considerable time they make their way out by the anus, drop on the ground, and are first transformed into chrysalids, and afterwards into parent flies. When bots fix themselves on the sensible portion of the stomach they may do harm; but no medicine that we know of will destroy them. The *terres* or large round worm sometimes occasions mischief, when it exists in great numbers, such as a staring coat, binding of the hide, irregular appetite, and clammy mouth. The best remedy is the *spigelia marylandica* or Indian pink, in daily doses of half an ounce. *Tenia* are not common in the horse, now and then they exist, and are best combated by weekly doses of oil of turpentine, three ounces at a time, mixed by means of the yolk of an egg with half a pint of ale. The *ascaris* or thread worms are best removed by mercurial purgatives. The existence of worms may be known by the appearance of a yellow matter under the tail, and by the disposition the horse has to rub his fundament. Blaine recommends the following vermifuge: *powdered arsenic, eight grains, powder or tin finely scraped, Venice turpentine, half an ounce, make into a ball, and give every morning.* He also recommends salt to be given daily with the food; which agrees with our own experience as one of the best vermifuges known. It is a fact acknowledged by the residents along the sea-coast, that horses troubled with worms will often voluntarily drink largely of sea water, and thus cure themselves.

5910. *The diseases of the liver are acute inflammation or hepatitis, and chronic inflammation or yellows.* *Hepatitis* is the acute inflammation of this organ, which, like the lungs, stomach, and intestines, may spontaneously take on the affection. The symptoms are not unlike those which attend red colic, but with less violence. If it be not however arrested, the termination will be equally fatal. About the third day, the whites of the eyes turn yellow and the mouth also. Bleeding, blistering, and purgatives form the methods of cure as practised in red colic.

5911. *Chronic inflammation or yellows.* The liver of horses is less complex than that of many other animals, and is therefore not very liable to disease; indeed some authors affirm that the horse is never affected with jaundice, but that the yellowness of skin is a mere stomach affection: this is, however, erroneous, and not only does the liver become hardened and thickened occasionally; but the bile becomes diseased, and is thrown out in that state by the blood over the body. If fever be present, bleed, but if the symptoms present no token of active inflammation, give each night, ten grains of calomel, and every ten days, work it off with a mild dose of physic. It is, however, necessary to remark, that it is not every yellowness of the skin that betokens either an acute or chronic inflammation of the liver. It is the property of every serious inflammation of any of the important organs of the chest and belly, to communicate a portion of the evil to the other organs immediately in conjunction with the liver: thus an affection of the stomach or intestines, of the inflammatory kind, very often occasions redness of the membranes of the nose, eyelids, &c. &c.

5912. *Diseases of the urinary organs.* Inflammation of the kidneys is an idiopathic affection, not one of frequent occurrence; but as brought on by injuries, such as over-riding, heavy loads, or violent diuretics, it is not unfrequent; when idiopathic, it may be the effect either of cold, heating food, or a translocation of some other inflammation, in which cases, it comes on suddenly, and assumes the same febrile appearances that other intestine inflammations produce; but there is not often great apparent pain, but a frequent inclination to stale, the quantity made being so small as almost to amount to a stoppage of urine, which is less or more complete, as one or both kidneys are affected. What little urine is made is also at first very thick, and then bloody. When the disease is the effect of external injury, the urine is not so scanty, but is more bloody; and this symptom precedes the other. There is usually much pain and stiffness about the loins, and we learn from Blaine, that a swelling and a paralytic affection of the hind leg of the side of the affected kidney, sometimes is a feature in the complaint. To distinguish this inflammation from that of the neck or body of the bladder, with which it may be confounded, the same author recommends that the hand be passed up the rectum, when, if the affection belong to the kidneys, the bladder, whether full or empty, will not be hotter than usual; but the contrary occurs when any part of the bladder is the seat of the disease.

5913. *The treatment* must be active, and in most respects similar to what has been recommended for red colic, as regards bleeding, emptying the bowels, and endeavoring to lessen the arterial action by bleeding: but here we must carefully abstain from irritating the kidneys by diuretics internally, or blisters ex-

ternally. A newly stripped sheep skin placed over the loins, or active fomentations of hot water, are the only sources of counterirritation that are proper; neither should diluting liquors be pressed, on account of the distention they occasion, but no evil can arise from clystering.

5814. *Inflammation of the bladder.* When the body of the bladder becomes inflamed, there is frequent staling from the very first attack; but when the neck of the bladder is the seat of the evil, the squeezing out of a few drops will only take place when the bladder has become filled, which may be known by passing the hand up the rectum. The treatment will be alike in both cases, and is the same as recommended for the last affection. It must be evident, that warm, mild, and frequent clystering, must here be peculiarly advisable.

5815. *Strangury or suppression of urine; incontinence of urine; bloody urine.* Strangury may arise from an injury done to the kidneys, or to the bladder, by strains, or by the absorption of irritating matters. In these cases, bleed if there be fever, and if not, merely give the horse absolute rest; mash him, give gruel, and warm his water for drink. *Bloody urine* should be treated in the same way; some horses have such a natural or acquired weakness of kidneys, as to stale blood with their urine on every occasion of over-exertion: the means frequently used for relief are such as aggravate the complaint, and indeed are often the occasion of it, which are diuretics. Strong diuretics injure horses more than strong physic, and benefit them less than any other of the popular means made use of. In retentions of urine, but particularly in the case of bloody urine, they are absolutely improper.

5816. *Diabetes, profuse staling, or passing evil.* This disease is more frequently forced on the horse, by long continued diuretics, or from a similar effect brought on by kiln-dried oats, mow-burnt hay, and some green vegetables, than acquired from constitutional indisposition. The horse first stales often and profusely, he then becomes weak and faint, and sweats on any exertion. If it be at all constitutional, his hide is bound from the beginning, and his urine will have a sweet taste; but if his appetite were good, and his coat sleek, bright, and elastic when the urine was first observed to be immoderate, the evil arises from some fault in the feeding, clothing, exercise, or other management of the horse. Examine into these matters, particularly into the food, and next the water. Enquire whether diuretics have been given, under an erroneous supposition of increasing the condition, and alter what may be amiss. If this do not remove the complaint, try the following, after Blaine's directions: *liver of sulphur two drachms, uva ursi four drachms, oak bark one ounce, catechu half an ounce, alum half a drachm*: give as a daily drink in a pint of water.

5817. *Stone and gravel.* Calculous concretions are not uncommon in the large intestines of horses, where they grow sometimes to an enormous size, lodged in one of the cells usually, and where they occasion but little inconvenience, except a displacement occurs, when serious evils, as colic, inflammation, or total stoppage, follow. In the bladder, stone is very seldom found; and there is reason to believe, that though gravel is a common term in the farrier's list, that it seldom if ever occurs; injuries of the kidneys and bladder being usually mistaken for it.

SUBJECT. 6. Diseases of the Skin.

5818. *Mange is a contagious disease* not uncommon among low bred and badly kept horses, but which is seldom generated in those properly managed. When it is the effect of impoverished blood, a different course of feeding must be substituted, not heating, but cooling though generous; as carrots, speared corn, malt mashes, stable soiling, &c. When it arises in full fed horses, bleed twice, lower the feeding, substituting for corn, soilings, carrots, or bran mashes. Give a nightly alterative (*Vet. Pharm.* 5831. No. 1. or 2.), and dress with either of the mange dressings. (*Vet. Pharm.* 5923.) After a cure has been effected, carefully clean all the apartments with soap and water.

5819. *Surfeit will now and then degenerate into mange*, but more generally it is brought on by a fulness of habit acted on by sudden transitions from cold to heat, or heat to cold; it is likewise not unfrequently the consequence of over-fatigue. If it show a disposition to spread, and the skin become scaly and scurfy, treat as under mange; otherwise treat as directed under want of condition. (5756.)

5820. *Wartles* are of the nature of surfeits in many instances, in others they are brought on by the pressure of the saddle, which either suppurate and burst, or become indolent and remain under the name of *stifasts*. In the early state, bathe them with chamberlye or vinegar: if they proceed to supuration refrain, and when they neither go back or come forward, put on a pitch plaster, and if this do not promote supuration, let the stiftast be dissected out.

5821. *Warts are common to old horses*, and had better be put up with, unless they be situated in some inconvenient or very conspicuous part. In this case tie a thread tightly around the root, and the wart will drop off, or it may be cut off. Blaine recommends the following, when warts are too numerous to be so removed: *crude sal ammoniac two drachms, powdered safin one ounce, lard an ounce and a half*. 5822. *Hide bound is a state of the skin*, where the interstitial matter between that and the fleshy pannicle is not in a state to allow of its pliancy and elasticity. The binding down of the hide thus closely, acts on the hair, which it protrudes in a contrary direction to its naturally inclined position; and thus a staring coat usually accompanies hide binding. In considering the subject of condition (5756.), we have seen that it is not a disease of itself, but is in every instance a symptom only.

SUBJECT. 7. Glanders and Farcy.

5823. *The glanders is the opprobrium medicorum*, for hitherto no attempts have succeeded in the cure of more than a few cases. By some peculiar anomaly in the constitution of the horse, although conclusive proofs are not wanting that this and farcy are modifications of one disease, and can each generate the other; yet the one is incurable, while the other is cured every day. When glanders has been cured, the time and labor necessary to accomplish the end has swallowed up the value of the horse; and has also in many supposed instances of cure, left the animal liable to future attacks which have occurred. The experiments on glanders, pursued at the veterinary college and by White of Exeter, have thrown great light on the disease itself, its causes, connections, and consequences; but have done little more. From these we are led to conclude that glanders will produce farcy, and that farcy can produce glanders. That glanders is highly infectious, and that such infection may be received by the stomach, or by the skin when it is at all abraded or sore: and it is also probable that it is received by the noses of horses being rubbed against each other. White's experiments go to prove that the air of a glandered stable is not infectious; but this matter is by no means certain, and should not be depended on without a greater body of evidence.

5824. *The marks of glanders* are a discharge of purulent matter from ulcers situated in one or both nostrils, more often from the left than the right. This discharge soon becomes glairy, thick, and white-of-egg-like: it afterwards shows bloody streaks, and is fetid. The glands of the jaw of the affected side, called the kernels, swell from an absorption of the virus or poison, and as they exist or do not exist, or as they adhere to the bone or are detached from it, so some prognosts is vainly attempted by farriers, with regard to the disease; for in some few cases these glands are not at all affected, and in a great many they are not bound down by the affection to the jaw. As there are many diseases which excite a secretion of matter from the nose, and which is kept up a considerable time; so it is not always easy to detect glanders in its early stages. Strangles and violent colds keep up a discharge from the nostril for weeks sometimes. In such cases a criterion may be drawn from the existence of ulceration within the nose, whenever the disease has become confirmed. These glanderous chances are to be seen on opening the nostril a little way up the cavity, sometimes immediately opposed to the opening of the nostril; but a solitary chancre does not determine the judgment. The health often continues good, and sometimes the condition also, until hectic takes place from absorption, and the lungs participate, when death soon closes the scene.

5825. The treatment of glanders, it has already been stated, is so uncertain that it is hardly worth the attempt; however, when the extreme value of the horse or the love of experiment leads to it, it may be regarded as fixed by experience, that nothing but a long course of internal remedies, drawn from the mineral acids, can effect it. These have all been tried in their endless variety: White recommends the mildest preparations of mercury, as *ethiops mineral*; under the conviction that the more acrid preparations disturb the powers of the constitution so much, as to destroy as effectually as the disease. At the veterinary college the *sulphate of copper* (blue vitriol) has been long in use. Others have used the *sulphates of iron and zinc*. Clark recommends the daily administration of a drink or ball, composed of the following ingredients: *sulphate of zinc 15 grains, powdered cantharides 7 grains, powdered assafoetida 15 grains*; of which he gives one or two extraordinary proofs of utility.

5826. The farcy is a disease more easily cured than the glanders, of which our daily experience convinces us; farcy, or farcin, attacks under distinct forms, one of which affects the lymphatics of the skin, and is called the *bud or button farcy*: the other is principally confined to the hind legs, which it affects by large indurations, attended with heat and tenderness. A mere dropical accumulation of water in the legs sometimes receives the name of *water farcy*; but this has no connection whatever with the true disease in question; farcy is very contagious, and is gained from either the matter of farcy or from that of glanders.

5827. Treatment of farcy. The distended lymphatics or buds may often be traced to one sore, which was the originally inoculated part, and in these cases the destruction of this sore, and that of all the farcied buds, will frequently at once cure the disease, which is here purely local. But when the disease has proceeded farther, the virus must be destroyed through the medium of the stomach; although even in these cases, the cure is rendered more speedy and certain, destroying all the diseased buds, by caustic or by cautery. Perhaps no mode is better than the dividing them with a sharp firing iron; or if deeper seated, by opening each with a lancet, and touching the inner surface with *lapis infernalis*. The various mineral acids may any of them be tried as internal remedies with confidence; never losing sight of the necessity of watching their effects narrowly, and as soon as any derangement of the health appears, to desist from their use; *oxy muriate of quicksilver* (corrosive sublimate) may be given in daily doses of fifteen grains; *acide of arsenic* may also be given in similar doses. The *subacetate of copper* (verdigris) may also be tried, often with great advantage, in doses of a drachm daily. Blaine joins these preparations, and strongly recommends the following: *oxy muriate of quicksilver, acide of arsenic, subacetate of copper, of each eight grains; sulphate of copper one scruple*; make into a ball and give every morning, carefully watching the effects, and if it be found to occasion distress, divide, and give half, night and morning. The same author professes to have received great benefit from the use of the following: *the expressed juice of clovers or goose-grass, a strong decoction of hempseds, and of assafras, of each six ounces*, to be given after the ball. It remains to say, that whatever treatment is pursued will be rendered doubly efficacious if green meat be procured, and the horse be fed wholly on it; provided the bowels will bear such food; but if the medicines gripe, by being joined with green food, add to the diet bean-meal. When green meat cannot be procured, carrots usually can; and when they cannot, still potatoes may be boiled, or the corn may be speared or malted. As a proof of the beneficial effects of green meat, a horse, so bad with farcy as to be entirely despaird of, was drawn into a field of tares, and nothing more was done to him, nor further notice taken of him, although so ill as to be unable to rise from the ground when drawn there. By the time he had eaten all the tares within his reach, he was enabled to struggle to more; finally he rose to extend his search, and perfectly recovered.

SUBJECT. 8. Diseases of the Extremities.

5828. Shoulder strains are very rare, most of the lamenesses attributed to the shoulder belong to other parts, and particularly to the feet. Out of one hundred and twenty cases of lameness before, Blaine found that three only arose from ligamentary or muscular extension of the shoulder, or rather of the adductor and sustaining muscles: when shoulder strain does happen, it is commonly the consequence of some slip, by which the arm is forced violently outwards. It is less to be wondered at than at first seems probable, that farriers mistake foot lameness for shoulder strains, when we reflect that a contracted foot occasions inaction, and favoring of the limb; which thus wastes the muscles of the shoulder. Seeing that one shoulder is smaller than the other, the evil is attributed to that, and it is pegged, blistered, swam, and fired, to the torture of the animal and the increase of the foot's contraction by the confinement. In real shoulder strains, the toe is dragged along the ground while in motion; at rest it is planted forward, but resting on the point of the toe. When the lameness is in the foot, the horse points his foot forward also, but he does so with the whole limb unbent, and the foot flat. These differences are highly necessary to attend to, as well as the peculiar difficulty there is in moving down hill, which he does with reluctance, and by swinging his leg round to avoid flexing it. This lameness may be farther brought to the test by lifting up the fore leg considerably, which, if the evil be in the shoulder, will give evident pain. The muscles between the fore legs are likewise tumefied and tender in these cases.

5829. The treatment consists, when it is recent, in bleeding in the plate vein, rowelling in the chest, and fomenting with hot water two or three times a day. When the heat and tenderness have subsided, first bathe daily with the astringent wash for strains (*Vet. Pharm.* 5886. No. 1.) for a week; and afterwards, if necessary, proceed to blister in the usual manner.

5830. Strain in the whirl bone (5655.). This important joint is sometimes strained, or its ligaments and muscles unnaturally extended, from a greater force being applied to them than their structure is able to bear, or their powers to resist: a lesion takes place of some of their fibrillae, or in lesser injuries their elasticity is injured by being put on the stretch beyond their power of returning. In all such cases, the parts react, and inflammation follows; by which heat, tenderness, and swelling ensue.

5831. Treatment. The first indication is the same in this as in all ligamentary strains, which is to moderate the inflammation by fomentations, &c. &c., and when that has subsided, to endeavor by astringents and bracers to restore the tone of the parts: after which, if any swelling remains, from the extravasated blood becoming organized, to promote its absorption by mercurial frictions, and blistering. This applies to all strains, and will direct the treatment therefore of that of strain in the articulation of the thigh with the body also.

5832. Strain in the stifle, is treated in the same manner.

5833. Strain or clap in the back sinews. This is generally an injury done to the sheaths of the tendons, or of the ligaments which bind them down. In very aggravated cases, it sometimes occurs that even the tendons themselves are extended beyond their capacity. The heat, swelling, and tenderness, are first to be combated by fomentations, and if these be extreme, bleed also, and give a dose of physic. Next proceed to poultice with saturnine applications, until the heat and swelling are reduced; then use tonics,

astringent wash, (*Vet. Pharm.* 5886. No. 1. or 2.): bandage and exercise very carefully. If swelling remain after heat, pain, and lameness are past; or when lameness only remains, after all heat is gone, proceed to blister mildly twice. In all cases of ligamentary extension when the heat has subsided, the part may be considered as in a state of atony; and bandages judiciously applied are then proper, particularly during the day.

5834. *Rupture of the tendons and ligaments of the leg.* It is very seldom that the tendons themselves are ruptured, but the suspensory ligaments are more often so, and the evil is called breaking down. It is usually very sudden, and the fetlock is brought almost to the ground. A perfect cure is seldom obtained; but the inflammation should be moderated by the means already described, and the heels should be raised. A laced stocking or firm bandage, when the inflammation has subsided, is necessary; and firing is often prudent as a permanent bandage.

5835. *Strains of the ligaments of the fetlock and coffin joints* often occur, and may always be distinguished by the heat, tenderness, and swelling. Treat as already described. In all strains of the leg, attended with inflammation, a goulard poultice is a convenient and useful application. The goulard water should be mixed with bran, and a worsted stocking being drawn over the foot, and up the leg, it is first tied around the foot; the poultice is then put in, and the stocking fastened around the leg above the injury. (5867.)

5836. *Mallenders and sellenders* are scurfy, scabby eruptions, affecting the back of the knee, and ply of the hock; common only in coarse, low-bred, and in cart-horses. Wash with soft soap every day, after which anoint with an unguent formed of equal parts of mercurial ointment, tar, and Turner's cerate.

5837. *Broken knees.* The usual cases of broken knees are referrible to wounds in general; and the treatment of them in no wise differs therefrom, with this caution, that here it is more immediately necessary, both for appearance and safety, that if any flap of skin hang apart, to cut it off, or the wound will heal with rugged edges. But when the joint of the knee is broken into by the violence of the injury, it becomes of a very different nature, and is known first by the extreme lameness and swelling that occur; and next, by the escape of a slippery mucus not unlike the white of an egg. If this continue to escape, violent inflammation follows, and either the horse or the joint are lost by it. Farriers are apt to attempt to stop the flow of the *joint oil*, as it is called, by oil of vitriol, or other escharotics, which treatment is usually followed by the most disastrous consequences. It is, however, necessary to stop the immediate flow, by other means; the best of which is by a fine budding-iron heated. Should the laceration be considerable, this cannot be done; but the treatment must then consist of saturnine poultices, bleeding, low diet, and the other antifebrile remedies, until the swelling has subsided, when apply the astringent paste recommended by Clark, made of pipe-clay and alum, every day; but by no means introduce any escharotics. On the subject of broken knees, a prejudice prevails, that a horse that has once broken his knees, is more liable to fall again than a horse that has not before fallen down; but unless the knees be injured so as to become stiff by such an accident, the supposition is wholly erroneous. Horses fall as often by treading on sharp stones when they have corns, as they do by stumbling; and as corns sometimes come on rapidly by pressure, so such a horse becomes afterwards liable to trip, and this gives rise to the opinion formed, that when once he has been down he will ever after be liable to it.

5838. *Splints and bone spavins.* The former are usually situated on the inner side of the canon or shank before; and as they are situated, so they are more or less injurious. When buried, as it were, within the tendons or back sinews, they are very apt to lame the horse seriously; but when situated on the plain bone, unless they be very large, they seldom do much injury. If a splint be early attended to, it is seldom difficult to remove. Blaine recommends the swelling to be rubbed night and morning for five or six days, with a drachm of mercurial ointment, rubbing it well in; after which to apply a blister, and at the end of a fortnight or three weeks to apply another. In very bad cases, he recommends firing in the lozenge form.

5839. *Bone spavin* is an exostosis of the hock bones, the treatment of which in no wise differs from that of splint; except that as a spavin in general is more injurious than a splint, so it is more necessary to commence the treatment early, and to continue it energetically. It also unfortunately happens, that from the complexity of structure on the hock, spavin is not so easily removed as splint, and more usually requires the application of firing.

5840. *Ring bone* is of the same nature, being an exostosis or bony circle formed around the coronet, the treatment of which is the same with splint and spavin.

5841. *Blood spavin, bog spavin, and thoroughpin*, are all of them originally of the nature of windgalls, and are nothing more than enlargements of the bursal capsules described in the anatomy, as surrounding tendons, ligaments, and bones, to furnish them with a lubricating medium. By over-exertion or hard work these bursal bags become extended, and their contents increased, and distended into puffy swellings in the hock, called, when on the ply, bog spavin. The pressure of this sometimes occasions a varicose state of the superficial vein, which passes directly over it on the inner side of the hock, and which enlargement then receives the name of *blood spavin*. When the bursal enlargement extends through the hock, it is called *thoroughpin*. When it is situated below, in the bursæ of the flexor tendons, near the fetlock joint, it receives the name of *windgall*.

5842. *The treatment* of all these cases must be similar in principle, and consists in lessening the distended sac; not as was formerly practised to the destruction of the horse often, by letting out the contents of these windgalls; but by strengthening the sides of the tumors by stimulants or by pressure. The more active stimulants are the liquid blister (*Vet. Pharm.* 5893.), milder ones are found in the astringent wash. (*Vet. Pharm.* 5886. No. 1.) Bandages assist greatly, when well applied to the part, and in desperate cases firing has been resorted to, which is nothing more than a more violent stimulant, and a more permanent bandage.

5843. *Capulet* is a bursal enlargement of the point of the hock, and is to be treated by friction, astringents, and bandage.

5844. *Curb* is an inflammation of the ligaments at the back of the hock, and is usually removed by astringents. (*Vet. Pharm.* 5886.) When it does not give way to these, the sweating liquid blister may be applied. (*Vet. Pharm.* 5894.)

5845. *Cracks and grease* may be considered as modifications of one and the same affection, and are commonly brought on by some neglect in all horses; but when they occur in any but the thick-heeled low-bred animals, they are invariably so. Over-feeding or under-feeding, but much more frequently the former, will bring it on. A very frequent cause of it is the practice of washing the legs of horses, and suffering them to dry of themselves. In every case, without exception, washing the legs should be avoided, unless they be rubbed perfectly dry afterwards. When horses have long hairs about their heels, and are washed and then left wet, the evil must be doubled; as the evaporation going on, cools and chills the heels, and thus produces a species of chilblain: and we well know how difficult these are to heal when broken. Cracks in the heels very often occur in horses removed too suddenly into full keep from previous straw or grass, or from these to a hot stable; which, by the heat and moisture of the litter, occasions a determination of blood and humors to the legs, and they break out into cracks or scabs, from which issue a bloody ichor, or a more thick matter. Between the sores the hair stares and gets pen-feathered, and the horse finds difficulty and pain in moving.

5846. *The treatment* must depend on the state in which the animal is at the present. If there be reason to suspect the horse to be full and foul, bleed, lower his food, soil him in the stable; or mash and give a mild dose of physic. But when some mismanagement is the sole cause, remove that, and if the case be a severe one, by means of an old stocking drawn over the foot, bury the whole heel in a poultice, made of scraped carrots or turnips; which will subdue the irritation, and bring the parts into a state to bear the application of the astringent paste (*Vet. Pharm.* 5888. No. 2.), or if more convenient, of the astringent wash

(*Vet. Pharm.* 5886. No. 1. or 2.) Moderate exercise should be continued, and the heels carefully cleaned from dirt by soft soap and water on each return therefrom; after which, always again apply the astringent. 5867. Grease is nothing more than an aggravated state of the same affection, and is more common to the hind than to the fore legs. Coarse fleshy-legged horses are peculiarly prone to the affection, from the great accumulation that takes place in their legs; and from the difficulty that the capillaries find in carrying the increased quantity of lymph upwards. In these, long stable confinement should be avoided, and when that is impossible, it should be counteracted by exercise frequently and judiciously administered. Many cart horses never go out but to work: they often work three days incessantly, or nearly so; and they perhaps rest two days entirely. Can it be wondered at, that the change occasions swelling, acting on the weakness and exhaustion of previous fatigue? and could not this be avoided by turning out for an hour; or walking for half an hour night and morning? Stable soiling should be used; bleeding and physicking also in very bad cases; and when the inflammation and irritation or soreness are great, the poultices recommended for cracks, should be applied until these circumstances are removed; when commence the use of some of the astringents recommended. (*Vet. Pharm.* 5886.) White has stated two remarkable cases of grease cured by the application of corrosive sublimate, in the form of a wash, as of two drachms of sublimate to ten ounces of water; increasing it to three drachms, if the pain occasioned by the first be not too considerable. Blaine says that the clivers or goose-grass has been known to be of great service in bad cases of grease: half a pint of the expressed juice to be given daily as a drink; and a poultice of the herb to be applied to the heels. In some cases of long standing when the running has ceased, a thickened state of the limb remains, which is best removed by firing, and which likewise is a preventive to a return.

SUBJECT. 9. Diseases of the Feet.

5848. *Founder of the feet is of two kinds*, an acute and a chronic. *Acute founder* is a disease that, until lately, was less understood than almost any other. After a very severe day's work, or when very much heated, if a horse get a sudden chill by standing in snow or cold water, it is not uncommon for him to be seized with universal stiffness and every symptom of great fever. Such a horse is said to be *body founded*. By degrees, however, it is observed that the animal has an extreme disinclination to remain on his feet; from whence it will appear that the whole of them are affected. When the horse draws his hind feet under him, his fore only are affected: and when he draws his fore feet under him, the hinder feet are the seat of the complaint; but which is seldom the case. On feeling the feet they will be found intensely hot, and the pastern arteries will beat with great violence. After a few days, unless the disease abate, a separation of the hoofs from the coronet takes place, and at last they fall entirely off.

5849. *The treatment.* At the commencement of the disease bleed largely, as well by the neck as from the toe of each affected foot, by paring, until the blood flows freely. After which immerse each foot in a goulard poultice, (5867.), give the fever powder or drink (*Vet. Pharm.* 5903. and 5910.), litter up to the belly; and if amendment do not take place, renew the bleedings, and blister round the pasterns.

5850. *Chronic founder, contraction or fever in the feet.* The artificial life that horses lead, subjects them to many diseases; one of the principal of which is that of contracted feet. Blaine considers a neglect of sufficient paring of hoof, the application of artificial heat from hot stables, and hotter litter, the deprivation of natural moisture, constitutional liability, and the existence of thrushes, as among the principal causes of this evil. It is more common to blood horses than to others; and he observes, that dark chestnuts are of all others most prone to it. The appearances of a contracted foot, as contrasted with a healthy one, we have already displayed (5751.) It is there shown that the contracted hoof becomes longer, higher, and narrower: the heels (fig. 621 a a) particularly are drawn in, and seem to screw the frog between them, which becomes wasted and thrushy from this pressure. The hinder hoofs are seldom affected.

5851. *The treatment of contraction in the feet.* It is better to prevent, than to be under the necessity of attempting to cure the evil. Prevention may be practised by avoiding the acting causes. As soon as at all suspected to be likely to occur, keep the hoofs pared low; never suffer the horse to stand on litter, nor allow the stable to be too hot, feed moderately, and never allow the horse to go without daily exercise; whatever increases the general fulness of habit, flies to the feet. Above all, keep the feet moist by means of wet cloths tied loosely around the coronet, falling over the whole hoof, but not extending beyond the edge. Then moisten repeatedly, and stop the feet (5818.) every night. When contraction has already taken place, many plans have been recommended; as jointed shoes by Coleman, Clark, and others; but it is not found that mechanical expansion in this way produces permanent benefit. The most effectual mode is to obviate all previous causes of contraction; and then to thin the hoofs around the heels from each quarter so thin as to be able to produce an impression by means of the thumb: in fact, to remove so much of the horn as is consistent with safety, from the coronet downwards. It is also prudent to put in a score or two from above downwards, drawn a quarter of an inch deep on each side towards the front of the hoof; but whether this be done or not, the front of the hoof should be rasped thin about an inch in width; by which means a hinge is formed, which operates most advantageously in opening the heels. After this is done, tips should be put on, and the horse should be turned out to grass, where he should remain three months, by which time the new formed heels will have reached the ground, and will bear a shoe. This process is fully described by Blaine in his *Veterinary Outlines*, where a plate completely elucidates the operation, and to which we would recommend the reader.

5852. *The pumiced foot* is a very common consequence of acute founder, in which the elasticity of the laminae becoming destroyed, the support of the coffin bone is removed, and it rests wholly on the sole, which it gradually sinks from a concave to a convex surface, drawing with it the front of the hoof inwards. In weak, broad, heavy feet, this evil comes on sometimes without founder; the treatment can be only palliative, a wide webbed shoe exactly fitted to the foot, without at all pressing on it, prevents the lameness consequent to the disease. A shoe exactly the contrary to this has been tried in some cases with benefit, the form of which has been one with a web so narrow as only to cover the crust, but so thick as to remove the feet from accidental pressure. In other cases, no shoe answers so well as a strong bar shoe. (3852.)

5853. *Corns* are most troublesome ailments, to which horses are very liable, and which injure and ruin thousands; they are wholly accidental; no horse having any peculiar tendency to them, but being always brought on them by some improper pressure, usually of the shoe, or from something getting in between the shoe and the horny heel. A shoe too long worn is a very common cause, and a still more frequent one is the clubbing the heels of the shoe; neither is it necessary to the production of corns, that the shoe itself should press on the sole; but they are equally produced when the outer horn of the heels or of the bars, is the immediate offending part, rendered so by too luxuriant growth, by unequal wear, or by secondary pressure from the shoe, or by gravel working in. (fig. 621.) It is the fleshy sole itself that is bruised, from which, a speck of extravasated blood follows; and if not immediately relieved, it gathers, or the part becomes habitually defective, and instead of forming healthy horn, it always afterwards forms a spongy substance of extreme sensibility, and thus always is liable to produce pain and lameness when exposed to pressure.

5854. *The treatment of corns* is seldom difficult or unsuccessful at their first appearance, but afterwards, it can be only palliative. Blaine directs that by means of a fine drawing knife, every portion of diseased horn should be pared away, and the extravasation underneath likewise. Having done this, he advises to introduce some *butter of antimony* into the opening, to place over this some tow, which should be kept in its place by means of a splint. If any contraction of the heels (fig. 621 a a) be present, it will materially assist

the cure to lower them, and to thin the hoof a little around the quarters, and afterwards to put on a shoe without heels opposed to the corn, or a shoe chambered opposite the weak part; or a bar shoe may be applied, so framed as completely to leave the heel untouched. Introduce the butter of antimony once or twice more, with the interval of two days between, and then turn the horse out to grass: in about six weeks' time the foot will be sound. The treatment of corns, when of long standing, does not materially differ: for although they are never wholly eradicated, they may be rendered but little troublesome. The diseased part must be carefully pared out at each shoeing, and such a shoe put on as will completely free the heel from pressure.

5855. *Running thrush is always a dangerous disease*, and few errors in horse management are more glaring than the common one of supposing they are necessary to carry off humors. If less food, more exercise, cool stables, and dry standings, were substituted to correct the fulness, instead of thrushes, which invariably contract the feet whenever they continue any length of time, it would save many valuable horses. To the cure, begin by clearing out all the fissures of the frog (*fig. 621 a*) from loose ragged horn, and then introduce to the bottoms of the sinuses, by means of a thin piece of wood, some of the *thrush paste* (*Vet. Pharm.* 5885.), smeared on tow, which will enable it to be held within the cleft, especially if it be guarded by splints of wood passed under the shoe; renew the dressing daily: turning out to grass may be practised to great advantage for thrushes by this mode of dressing.

5856. *Sandcracks are fissures in the hoof*, commonly of those before, and usually towards the inner, but now and then towards the outer quarter also, from above downwards: from the crack, a little oozing of blood or moisture is seen; and the sensible parts underneath getting between the edges of horn, being pressed on, lame the horse. White recommends to fire the fissure crossways, so as to destroy the connection between the divided and the undivided parts of the hoof.

5857. *Pricks or punctures in the feet* are often very serious evils, either when received by nails in shoeing, or by one picked up on the road, &c. The danger arises from the inflammation, which is always great from any injury done to the sensible and vascular parts within the foot. This inflammation quickly proceeds to supuration; and the matter is apt to make its way upwards, unless it find a ready vent below. When it does not break out at the coronet, it will often penetrate under the sole, and finally disease the bones, ligaments, or cartilages, and produce quittor. It is very seldom that a horse is pricked in shoeing, but that the smith is aware of it by the peculiarity of the feel on the hammer, and by the flinching of the animal. At such times were he to immediately withdraw the nail a little, enlarge the opening, and introduce some spirit within the puncture, nothing would occur; but on the contrary, he sends the horse home to avoid trouble, who, the next or following day, is found lame, and with his foot hot. If the nail be only driven too near the sensible laminae, it will only require to be removed to free the horse from his evil; but if it have been driven through, and have wounded them, then supuration ensues, and on examining the foot by the pincers when the shoe is removed, he will flinch at the pressure on the diseased part. It is probable, on the removal of the shoe, that matter will at once flow out at the immediate nail hole; if not, the drawing knife will soon detect the injury. If the heat be great, and instead of matter, bloody dark ichor flows out, wrap the foot up in a poultice; but if healthy matter flows out, this will not be necessary: sometimes it is requisite to detach all the horn that is underrun by the matter; but when the injury has not proceeded to this extent, apply over the part a pledget of tow steeped in friar's balsam; tack on the shoe lightly, and retain the dressing by means of *splints*, which are thin pieces of wood (the withy which binds birch brooms, is convenient for the purpose,) passed under the shoe; repeat the dressing daily, and avoid moisture, which would encourage quittor. A nail picked up on the road, and which passes through the sole, below or through the frog, is to be treated in the same manner, and also when the matter breaks out at the coronet; but when a nail is picked up, and penetrates the coffin joint, which is known by the synovia or joint oil appearing; such opening should be immediately stopped by paring towards the wounded joint, and then applying a heated budding-iron, not to the capsular ligament itself, but to the skin immediately near it; if this be inconvenient, put a pledget dipped in a little butter of antimony, just within the opening, but do not press it into the cavity of the joint: if this be insufficient to stop the flow, but more particularly if the original wound penetrated to the bone, it is probable that the bone itself will become in some measure diseased, which is known by the rough grating felt at the point of the probe when passed. In this case, enlarge the opening so as to be able to scrape the diseased bone away. *Bruises of the sole*, from whatever cause, will all fall under some of these points of view, according as the case may be.

5858. *Quittor and canker are the consequences of these injuries* when neglected, or originally extensive. In these cases either the bones, ligaments, or cartilages, or all, become diseased; and a cure can only be obtained by removing the diseased parts by the knife or by caustic.

5859. *Treads, over-reach, &c.* A wound on the coronet is not uncommon from one foot being placed on the other; or the hinder foot may strike it, &c. First wipe away the dirt, and remove any loose edges that cannot unite; avoid washing, unless stones and dirt are suspected to be within, and bind up, having first placed over the wound a pledget of lint or tow moistened with balsamic tincture, or tincture of myrrh, or of aloes, &c. *Over-reaching, or over-stepping*, is often an injury done to the fetlock joint before, by the hinder foot, or to the back sinew higher up. Sometimes it is simply a violent bruise, at others the laceration is extensive, in which case treat as a tread; and when no laceration has taken place treat as a bruise or strain.

5860. *Cutting* is a defect to which some horses are liable from their form, as when they turn their toes out, or have bent legs. Others cut only when they are lean, which brings their legs nearer together. Weak horses cut because they cross their legs when fatigued, and young unfurnished horses cut at youthful periods, and grow out of it afterwards. The part in which a foot interferes with the opposed limb is very different. When it strikes the shank high up it is called *speedy cut*, and is best remedied by wearing knee boots or rollers. When it is at the fetlock the cutting is at the side, or rather backward, according to circumstances. Some horses cut by the edge of the shoe, others by the hoof at the quarters; and some by the point of the heels. It is to be remarked, that it is better to put up with the evil of cutting, than to do as is too frequently done, which is, to pare away the hoof until it excites contraction. The shoe may be feather edged, or it may be set a little within the cutting quarter; but by no means alter the size or the form of the hoofs themselves, and particularly avoid taking liberties of this kind with the fore feet. Boots, or rollers, are but little trouble to put on, and when not buckled too tight never injure: whereas to allow a horse to continue to cut produces a callus, and often throws the animal down.

SECT. VI. Veterinary Operations.

5861. The general practices to be here enumerated are chiefly the treatment of wounds, the application of fomentations, setons, blisters, clysters, and physicking; and the operations of castrating, nicking, bleeding, &c.

SUBSECT. 1. Treatment of Wounds.

5862. A wound must be treated in some measure according to the part of the horse's body in which it happens; but there are some principles to be observed alike in all horse surgery. There are likewise a few, which, as they differ from the principles of human surgery, should be first noticed, and which should guide the practice of those who might be misled by analogy. The wounds of horses, however, carefully brought together and confined in their situation, as well as shut out from the at-

muscles of the external air, are seldom disposed to unite at once, or, as it is called in surgical language, by the *first intention*. It is always, therefore, necessary to expect the suppurative process: but as the adhesive inflammation does now and then occur, we should never wash with water or other liquids a mere laceration, if no foreign matter, as dirt, &c., be suspected to be lodged within it, still less should we stuff it with candle or tents of any kind. On the contrary, it should be carefully and smoothly brought together, and simply bound up in its own blood; and if it do not wholly unite at once, and by the *first intention*, perhaps some portion of it may; and, at all events, its future progress will be more natural, and the disfigurement less than when stuffed with tents, tow, &c., or irritated with heating oils or spirits. When an extensively lacerated wound takes place, it is common, and it is often necessary to insert sutures, or stitches, into the lips of the wound: and here we have to notice another considerable variation from the principles of human inflammation, which is, that these stitches in the horse, ox, and dog, soon ulcerate out, seldom remaining longer than the third or fourth day at farthest. It therefore is the more necessary to be careful, that by perfect rest, and the appropriation of good bandages, we secure the wound from distortion. In this we may be assisted by strips of sticking plaster, made with diachylon and pitch: but these strips should be guarded from touching the wound itself by means of lint or tow first put over it. When, in addition to laceration in a wound, there is a destruction of substance, then the caution of washing will not apply, as it will be necessary to bathe with some warming spirit, as, *tincture of myrrh*, *tincture of aloes*, or *Fraser's balsam*, to assist in restoring the life of the part, and in preventing mortification. Bleeding must be stopped by pressure and astringents, as powdered alum: when it is very considerable, the vessel from whence the blood comes must be taken up. When great inflammation follows wounds or bruises, counteract it by bleeding, a cooling temperature, opening medicines, and continual fomentations to the part itself.

SUBJECT. 2. Balls and Drinks.

5863. *Mode of giving a ball.* Back the horse in his stall, and being elevated on a stool, (not a bucket turned up side down,) gently draw the tongue a little out of the mouth, so as to prevent its rising to resist the passage of the hand: the tongue should however not be laid hold of alone, but it should be held firmly by the fingers of the left hand against the jaw. The ball previously oiled, being taken into the right hand, which should be squeezed into as narrow a shape as possible, must be passed up close to the roof of the mouth, and the ball placed on the roof of the tongue, when both hands being withdrawn, it will readily pass down. This mode is much preferable, when a person is at all handy, to using a balling iron. At Long's, veterinary surgeons' instrument maker, is sold a clever machine for this purpose.

5864. *Mode of giving a drink.* Exactly the same process is pursued, except that a horn holding the liquid matter is forced up the mouth; the passage being raised beyond the level line, the liquid is poured out from the larger end of the horn, and when the tongue is loosened it is swallowed. Clark, however, ingeniously proposes to substitute the smaller end of the horn, the larger being closed, by which, he says, the horn can be forced up the mouth between the teeth, and poured farther back so as to ensure its not returning.

SUBJECT. 3. Fomentations and Poultices.

5865. *Fomentations* are very commonly recommended of various herbs, as rue, chamomile, St. John's wort, wormwood, bay leaves, &c.; but the principal virtue is to be found in warmth and moisture, which unload the vessels: but this warmth ought not to be too considerable, except when the inflammation is within, as in inflamed bowels. Here we foment to stimulate the skin, and cannot foment too hot: but when we do it at once to an inflamed part, it ought not to be more than of blood heat; and it should be continued long, and when removed the part should be dried or covered, or cold may be taken, and the inflammation increased instead of diminished. *Anodyne fomentations* are made of poppy heads, and of tobacco, and are frequently of great use.

5866. *The method of applying fomentations* is conveniently done by means of two large woollen cloths wrung out of the heated liquors; as one is cooling the other should be ready to be applied.

5867. *Poultices* act in the same way as fomentations in allaying irritation and inflammation; but are in some respects more convenient, because they act continually. It is an error to suppose that poultices, to be beneficial, should be very hot: however hot they may be applied, they soon become of the temperature of the surrounding parts. When poultices are applied to the extremities, a stocking, as has been before stated, is a convenient method of application. When it is drawn over the leg and bound around the lower part of the hoof, or of the pastern, or otherwise, the matter of the poultice may be put within, and it may be then kept in its situation, if high up on the extremity, by means of tape fastened to one part of it, and passed over the withers or back to the other side, and again fastened to the stocking. In this way, also, loose bandages may be retained from slipping down. *Cold poultices* are often useful in the inflammations arising from strains, &c. In these cases bran and gouldard water form a convenient medium: but when the poultice is necessarily hot, a little linseed meal added to the bran will render it adhesive, and give it consistence. It is a very necessary caution in this, as in every instance where bandages are wanted around the extremities, to have them broad, and only so tight as to secure the matters contained, as in a poultice, or as in common bandaging. It is often supposed that "as strong as a horse," denotes that nothing can be too strong for him, nor any means too violent to hurt him. The horse, on the contrary, is one of the most tender animals alive; and a string tied very tight round the leg would occasion, first a falling off of the hoof, next a mortification of the rest of the limb, and lastly the death of the animal; and all this as certainly as though he were shot with a bullet through the head.

SUBJECT. 4. Setons and Rows.

5868. *Setons* are often useful in keeping up a drain to draw what are termed humors from parts; or by their irritations on one part, they lessen the inflammation in another part not very remote, as when applied in the cheek for ophthalmia or inflamed eyes. They also in the same way lessen old swellings by exciting absorption. Another useful action they have is to make a dependent or convenient orifice for the escape of lodged matter: thus a seton passed from the upper part of the opening of pole evil, through the upper part of the integuments of the neck, as low as the sinuses run, will often effect a cure without farther application. The same with fistulous withers, which sometimes run under the shoulder blade, and appear at the arm point; in which cases a blunt seton needle, of sufficient length to be passed down to that point, and to be then cut down upon, will form the only efficient mode of treatment. Setons may be passed in domestic farriery, with a common packing needle and a skain of thread, or piece of tape: but in professional farriery they are made by a proper needle armed with tape or lamp cotton, or skains of thread or silk smeared over with digestive ointment. When the seton needle is removed, the ends of the tape should be joined together, or otherwise knotted, to prevent them from coming out.

5869. *Rows* in their intention act as setons, and as irritating a larger surface, so when a general drain is required they act better; as in grease, &c.: but when their action is confined to a part only, setons are more convenient. Any person may apply a rowel by making an incision in the loose skin about an inch, separating with the finger its adherences around, and then inserting in the opening a piece of round leather with a hole in the middle smeared with a blistering ointment. Then plug the opening with tow, and in three days, when the suppuration has begun, remove it. The rowel leather is afterwards to be daily moved and cleaned.

SUBJECT. 5. *Blistering and Firing.*

5870. *Blistering* answers the same purposes as setons; and is practised by first cutting or shaving the hair from the part, when the blistering ointment (*Vet. Pharm.* 5890.) should be well rubbed in for ten minutes, or a quarter of an hour. Some of the ointment after the rubbing may be smeared over the part. The head of the horse should now be tied up to prevent his gnawing or licking. If a neck cradle be at hand it may also for safety be put on; in which case the head may let down the third day.

5871. A *neck cradle for blistered horses* is very convenient for other occasions also, when the mouth is to be kept from licking or biting other parts; or to keep other parts from being rubbed against the head. It is of very simple construction, and may be made by a dozen pieces of wood of about an inch and half diameter, as old broom handles, &c. These bored at each end admit a rope to be passed through; and as each is passed on, a knot may be tied to the upper part of the pieces of the cradle, two inches apart; and those which form the lower part, four inches; by which means the neck will be fitted by the cradle when it is put on; and the horse will be prevented from bending his head to lick or gnaw parts to be protected. When the lower parts of the legs, particularly of the hider, require blistering, it is necessary to bear in mind that in gross full horses, particularly in autumn, grease is very apt to follow blistering; and almost certainly if the back of the heels below the fetlock be blistered. First, therefore, smear this part over with lard or suet; and afterwards avoid touching it with the ointment. After blistering in summer, the horse is often turned out before the blistered parts are quite sound; in this case guard them from flies by some kind of covering, or they may become fly-blown; and likewise the fourth or fifth day rub into the blistered part some oil or lard to prevent the skin from cracking.

5872. *Sweating or liquid blisters* (*Vet. Pharm.* 5894.) are only more gentle stimulants, which are daily applied to produce the same effects on a diseased part without removing the hair. Of course less activity is expected; yet as the action is repeated, they are often more beneficial even than blistering itself: as in old strains and stiffnesses.

5873. *Firing*, as requiring the assistance of an experienced practitioner, we shall not describe; it will be only prudent to point out that it is a more active mode of blistering; and that it acts very powerfully as a stimulant, not only while its effects last as blisters do, but also after its escharotic effect is over, by its pressure; and in this way it is that it operates so favorably in bony exostosis, as splints and spavins; and in this way it is so useful in old ligamentary weaknesses; because by lessening the dilatibility of the skin it becomes a continual bandage to the part.

SUBJECT. 6. *Clystering and Physicking.*

5874. *Clystering* should always be preceded by *back-raking*, which consists in oiling one hand and arm, and passing them up the fundament, and by that means to remove all the dung balls that can be reached. The large pewter syringe for clystering, is neither a useful or safe machine. A much better consists in a turned box pipe, to which may be attached a large pig or ox-bladder, by which four or five quarts of liquid can be administered at one time (*Vet. Pharm.* 5895. to 5898.). The pipe should be previously oiled, by which means it passes more easily: the liquor should then be steadily pressed up; and when the pipe is removed, the tail should be held down over the fundament a little to prevent the return of the clyster. In some cases of a spasmodic nature, as gripes and locked jaw, great force is made by the bowels to return the clyster, and nothing but continued pressure over the fundament can enable it to be retained. *Clysters* not only act in relaxing the bowels, but they may be used as means of nutriment when it cannot be taken by the mouth; as in locked jaw, wounds of the mouth, throat, &c. &c. In locked jaw, it was observed by Gibson, that he kept a horse alive many days by clysters alone: and by clysters also, many medicines may be given more conveniently than by the mouth.

5875. *Physicking of horses.* It is equally an error to refrain altogether from giving horses physic, as it is to give it on every occasion, as some do. Neither is it necessary for horses to be bled and physicked every spring and autumn, if they be in perfect health, and the less so, as at this time they are generally weak and faint from the change going on in their coats. Nor is it always necessary to give horses physic when they come from grass or a straw yard; provided the change from the one state to the other be very moderately brought about. But on such a removal, it certainly expedites all the phenomena of condition, (5754.), and such horses are less likely to fall to pieces, as it is termed, afterwards. (5755.) In various morbid states physic is particularly useful, as in worms, hide-bound, from too full a habit, &c. &c. It is not advisable to physic horses in either very cold, or very warm weather. Strong physic is always hurtful: all that physic can do is as well operated by a mild as by a strong dose, with infinitely less hazard. No horse should be physicked whose bowels have not been previously prepared by mashing for two days at least before. By these means the physic will work kindly, and a moderate quantity only is requisite. Most of the articles put into the purging balls for horses, to assist the aloes, are useless. Jalap will not purge a horse, nor rhubarb either. Aloes are the only proper drug to be depended on for this purpose, and of all the varieties of aloes the socotorine and Cape are the best (*Vet. Pharm.* 5915.) Barbadoes aloes are also not improper, but are thought more rough than the socotorine. For formulae of purging balls, see *Vet. Pharm.* (5915.) Blaine gives the following as the process.

5876. *Physicking process.* The horse having fasted an hour or two in the morning from food, but having had his water as usual; give him his purge, and two hours after offer him a little chilled, but not warm water, as is often done, by which horses are disgusted from taking any: it may be here remarked that in this particular much error is frequently committed. Many horses will drink water with the chill taken off, provided it be perfectly clean, and do not smell of smoke from the fire, kettle, or saucepan: but few, very few, will drink warm or hot water; and still fewer, if it be in the least degree greasy or smoky. After the ball has been given two hours, a warm bran mash may be offered, and a very little hay. He should have walking exercise as usual, moderately clothed: and altogether he should be kept rather more warm than usual. At noon mash again, and give a little hay, which should be repeated at night, giving him at intervals chilled water. On the following morning the physic may be expected to work; which if it do briskly, keep the horse quiet: but should it not move his bowels, or only relax them, walk him quietly half an hour, which will probably have the desired effect. Continue to give mashes and warm water, repeating them every two or three hours to support him. When physic gripes a horse, give him a clyster of warm water, and hand rub the belly, as well as walk him out. If the griping prove severe, give him four ounces of gin in half a pint of sound ale, which will soon relieve him. On the next day the physic will probably set, but should it continue to work him severely, pour down some boiled starch; and if this fail, turn to the directions under diarrhoea. (5804.) The horse should return to his usual habits of full feeding, and full exercise by degrees; and if more than one dose be to be given, a week should intervene. It is often requisite to make the second and third doses rather stronger than the first. A very mild dose of physic is likewise often given to horses while at grass in very warm weather, and without any injury. When worms, or skin foulness are present, and mercurial physic is deemed necessary, it is better to give two drachms of calomel in a mash the previous night, than to put it into the purging ball.

SUBJECT. 7. *Castration, Nicking, Docking, &c.*

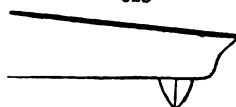
5877. The operations of *castration*, *docking*, *nicking*, and that of *cropping* (which is now seldom practised), all require the assistance of a veterinary surgeon; and it is only necessary to remark of them, that the after treatment must be the same as in all other wounds. To avoid irritation, to preserve a cool temperature and a moderate diet; and if active febrile symptoms make their appearance, to obviate them by bleeding, &c., &c. It likewise is proper to direct the attention of the agriculturist who attends to these

matters himself, that the moment the wound following any of these operations looks otherwise than healthy, locked jaw is to be feared, and no time should be lost in seeking the best assistance that can be obtained. (5763.)

SUBJECT. 8. Bleeding.

5878. *Bleeding* is a very common, and to the horse a very important operation, because its inflammatory diseases, on account of the great strength of his arterial system, run to a fatal termination very soon, and can only be checked in the rapidity of their progress, by abstracting blood, which diminishes the momentum of circulation. Bleeding is more particularly important in the inflammatory diseases of the horse; because we cannot, as in the human, lower the circulation by readily nauseating the stomach. Bleeding also lessens irritation particularly in the young and plethoric, or those of full habit: hence we bleed in spasms of the bowels, in locked jaw, &c., with good effect. Bleeding is general or topical. *General*, as from the neck, when we mean to lessen the general momentum. *Topical*, when we bleed from a particular part, as the eye, the plate vein, the toe, &c. Most expert practitioners use a large lancet to bleed with; and when the habit of using it is acquired, it is by far the best instrument, particularly for superficial veins where a blow might carry the steam through the vessel. In common hands the steam (fig. 623.), as the more general instrument, is best adapted to the usual cases requiring the agriculturist's notice. Care should, however, be taken not to strike it with vehemence; and the hair being first wetted and smoothed down, it should be pressed close between the hairs, so that its progress may not be impeded by them. A ligature should be first passed round the neck, and a hand held over the eye, unless the operator be very expert, when the use of the fingers will dispense with the ligature. The quantity of blood taken is usually too small. In inflammatory diseases, a large horse, particularly in the early stage of a complaint, will bear to lose eight or ten quarts: and half the quantity may be taken away two or three times afterwards, if the violence of the symptoms seem to require it; and the blood should be drawn in a large stream to do all the good it is capable of. After the bleeding is finished, introduce a sharp pin, and avoid drawing the skin away from the vein while pinning, which lets the blood escape between the vein and skin: wrap round a piece of tow or hemp, and next day remove the pin, which might otherwise inflame the neck. In drawing blood, let it always be measured: letting it fall on the ground prevents the ascertaining the quantity; it also prevents any observation on the state of the blood, which if it form itself into a cup-like cavity on its surface, and exhibit a tough yellow crust over this cavity, it betokens an inflammatory state of body that will require further bleedings, unless the weakness forbid. After the bleeding, it now and then happens, from rusty lancets, too violent a stroke with the blood stick, or from drawing away the skin too much while pinning up, that the orifice inflames and hardens, and ichor is seen to ooze out between its edges. Immediately this is discovered, recourse must be had to an able veterinary surgeon, or the horse will lose the vein, and perhaps his life.

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SECT. VII. The Veterinary Pharmacopeia.

5879. The following *formulae for veterinary practice* have been compiled from the works of the most eminent veterinary writers of the present day, as Blaine, Clark, Laurence, Peel, White, &c.; and we can from our own experience also, confidently recommend the selection to the notice of agriculturists, and the owners of horses in general. It would be prudent for such as have many horses, and particularly for such as live at a distance from the assistance of an able veterinarian, to keep the more necessary articles by them in case of emergency: some venders of horse drugs keep veterinary medicine chests; and where the compositions can be depended on, and the uncompounded drugs are genuine and good, one of these is a most convenient appendage to every stable. The best arranged veterinary medicine chest we have seen, was in London, at the veterinary laboratory of Youatt of Nassau Street, Middlesex Hospital.

5880. *The veterinary pharmacopeia for oxen, calves, and sheep* has been included in the arrangement. When any speciality occurs, or where distinct recipes are requisite, they have been carefully noticed; it will therefore only be necessary to be kept in mind, that with the exception of acrid substances, as mineral acids, &c., which no cattle bear with equal impunity with the horse; the remedies prescribed require about the following proportions. A large ox will bear the proportions of a moderate sized horse; a moderate sized cow something less; a calf about a third of the quantity; and a sheep about a quarter, or at most a third of the proportions directed for the cow. It is also to be remarked, that the degrees in strength in the different recipes, are usually regulated by their numbers, the mildest standing first.

5881. Alteratives.

1.
Levigated antimony, 2 drachms.
Cream of tartar,
Flower of sulphur, each half an ounce.

2.
Cream of tartar,
Nitric, of each half an ounce.

3.
Ethiops mineral,
Levigated antimony,
Powdered resin, each 3 drachms.
Give in a mash, or in corn and bran a little wetted,
every night, or make into a ball with honey.

5882. Tonic Alteratives.

1.
Gentian,
Aloes,
Ginger.
4 Mace vitriol, in powder, of each 1 drachm.
Oak bark in powder, 6 drachms.

2.
Winter's bark in powder, 3 drachms.
Green vitriol, do., one and a half drachm.
Gentian, do. 3 drachms.

Make either of these into a ball with honey, and give every morning.

3.
White vitriol, 1 drachm.
Ginger or pimento ground, 2 drachms.
Powdered quassia, half an ounce.
Ale, 8 ounces. — Mix, and give as a drink.

4.
Arsenic, 10 grains.
Oatmeal, 1 ounce.
Mix, and give in mash or moistened corn nightly.

5883. Astringent Mixtures for Diarrhoea, Lax, or Scouring.

1.
Powdered ipecacuanha, 1 drachm.
Do., opium, half a drachm.
Prepared chalk, 2 ounces.
Boiled starch, 1 pint.

2.
Suet, 4 ounces; boiled in
Milk, 8 ounces.
Boiled starch, 6 ounces.
Powdered alum, 1 drachm.

The following has been very strongly recommended in some cases, for the lax of horses and cattle.

3.
Glauber's salts, 2 ounces.
Epsom do., 1 ounce.
Green vitriol, 4 grains.
Gruel, half a pint.

When the lax or scouring at all approaches to dysentery or mottened grease, the following drink should be first given.

4.
Castor oil, 4 ounces.
Glauber's salts (dissolved), 2 ounces.
Powdered rhubarb, half a drachm.
Powdered opium, 4 grains.
Gruel, 1 pint.

5884. *Astringent Balls for Diabeses or Pissing Evil.*
Catechu (Japan earth), half an ounce.
Alum powdered, half a drachm.
Sugar of lead, 10 grains.
Conserve of roses to make a ball.

5885. *Astringent Paste for Thrush, Foot-rot, Foul in the Foot, &c.*

Prepared calamine,
Verdigris, of each half an ounce.
White vitriol,
Alum, of each half a drachm.
Tar, 3 ounces: mix.

5886. *Astringent Washes for Cracks in the Heels, Wounds, &c.*

1.
Sugar of lead, 2 drachms.
White vitriol, 1 drachm.
Strong infusion of oak, or elm bark, 1 pint: mix.
2.
Green vitriol, 1 drachm.
Infusion of galls, half a pint.
Mix, and wash the parts three times a day.

5887. *Powder for Cracks, &c.*

3.
Prepared calamine, 1 ounce.
Fuller's earth, powdered,
Pipe clay, do., of each 2 ounces.
Mix, and put within gauze and dab the moist surfaces of the sores frequently.

5888. *Astringent Paste for Grease.*

1.
Prepared calamine,
Tutty powdered,
Charcoal, do. of each 2 ounces.
Yeast enough to make a paste.

2.
To the above, if more strength be required, add of alum and verdigris, each a drachm.

5889. *Astringent Wash for Do.*

3.
Corrosive sublimate, 2 drachms.
Spirit of wine or brandy, 1 ounce.
Soft water, 10 ounces.
Rub the sublimate in a mortar with the spirit till dissolved, then add the water. This is a strong preparation, and has often proved successful in very bad cases of grease, which have resisted all the usual remedies.

5890. *Blistera.*

1. A general one.
Cantharides powdered, 2 ounces.
Venice turpentine, do.
Resin, do.
Palm oil or lard, 2 lbs.
Melt the three latter articles together, and when not too hot stir in the Spanish flies.

2.
5891. *A strong cheap Blister, but not proper to be used in Fevers, or Inflammations, as of the Lungs, Bowels, &c.*
Euphorbium powdered, 1 ounce.
Oil of vitriol, 2 scruples.

Spanish flies, 6 ounces.
Palm oil or lard,
Resin, of each, 1 lb.
Oil of turpentine, 3 ounces.

Melt the resin with the lard or palm oil. Having previously mixed the oil of vitriol with an ounce of water gradually, as gradually add this mixture to the melted mass; which again set on a very slow fire for ten minutes more: afterwards remove the whole, and when beginning to cool, add the powders previously mixed together.

3.
5892. *A Mercurial Blister for Spinals, Spasms, and Ringbones.*

Of either of the above, 4 ounces.
Corrosive sublimate, finely powdered, half a drachm.

5893. *Strong Liquid Blister.*

Spanish flies in gross powder, 1 ounce.
Oil of origanum, 2 drachms.
Oil of turpentine, 4 ounces.
Olive oil, 2 ounces.
Steep the flies in the turpentine three weeks, strain off, and add the oil.

5894. *Mild Liquid or Sweeting Blister.*

Of the above, 1 ounce.
Olive oil or goose grease, one and a half ounce.

5895. *Clysters, or, Laxative one.*

1.
Thin gruel or broth, 5 quarts.
Epsom or common salts, 6 ounces.

5896. *Clyster for Gripes.*

2.
Mash two moderate sized onions,
Pour over them oil of turpentine, 2 ounces.
Capsicum, or pepper, half an ounce.
Thin gruel, 4 quarts.

5897. *Nutritious Clyster.*

3.
Thick gruel, 3 quarts.
Strong sound ale, 1 quart.

4.
Strong broth, 2 quarts.
Thickened milk, 2 quarts.

5898. *Astringent Clyster.*

5.
Tripe liquor, or suet boiled in milk, 3 pints.
Thick starch, 2 pints.
Laudanum, half an ounce.

6.
Alum whey, 1 quart.
Boiled starch, 2 quarts.

5899. *Cordial Balls.*

Gentian powdered, 4 ounces.
Ginger, do., 2 ounces.
Coriander seeds, do., 4 ounces.
Caraway, do. 4 ounces.
Oil of aniseed, a quarter of an ounce.
Make into a mass with honey, treacle, or lard, and give one ounce and a half for a dose.

5900. *Chronic Cough Balls.*

1.
Calomel, 1 scruple.
Gum ammoniacum,
Horse radish, of each 2 drachms.
Balsam of Tolu,
Squills, each 1 drachm.
Beat all together, and make into a ball with honey, and give every morning fasting.

5901. *Drink for the same.*

2.
Tar water,
Lime water, of each half a pint.
Tincture of squills, half an ounce.

5902. *Powder for the same.*

3.
Tartar emetic, 2 drachms.
Powdered foxglove, half a drachm.
Powdered squill, half a drachm.
Calomel, 1 scruple.
Nitre, 3 drachms.
Give every night in a malt mash.

5903. *Diuretic Balls.*

Resin, yellow, 1 lb.
Nitre, half a pound.
Horse turpentine, half a pound.
Yellow soap, quarter of a pound.

Melt the resin, soap, and turpentine over a slow fire; when cooling, add the nitre. For a strong dose, an ounce and a half, for a mild one an ounce. It should be kept in mind, that mild diuretics are always equal to what is required; and that strong diuretics are always hurtful.

5904. *Diuretic Powders.*

Yellow resin, powdered, 4 ounces.
Nitre, ditto, 8 ounces.
Cream of tartar, ditto, 4 ounces.

Dose—6, 8, or 10 drachms nightly, which some horses will readily eat in a mash.

5905. *Urine Drink.*

Glauber's salts, 2 ounces.
Nitre, 6 drachms.

Dissolve in a pint of warm water.

5906. *Embrocations.—Cooling for Inflammations.*

1.
Goulard's extract, half an ounce.
Spirit of wine or brandy, 1 ounce.
Soft water, 1 quart.

2.
Mindererus spirit, 4 ounces.
Water, 12 ounces.

5907. *For Strains.*

Bay salt, bruised, half a pound.
Crude sal ammoniac, 2 ounces.
Sugar of lead, quarter of an ounce.
Vinegar, 1 pint and a half.
Water, 1 pint.

5908. *For the Eyes.*

1.
Sugar of lead, 1 drachm.
White vitriol, 2 scruples.
Water, 1 pint.

2.
Brandy, 1 ounce.
Infusion of green tea, 4 ounces.
Tincture of opium, 2 drachms.
Infusion of red roses, 4 ounces.

3.
Rose water, 6 ounces.
Mindererus spirit, 3 ounces.

4.
Corrosive sublimate, 4 grains.
Alcohol, 1 ounce.
Lime water, 1 pint.

5.
Alum, powdered, 1 drachm.
Calomel, half a drachm.
Mix, and insert a little at one corner of the eye.
The custom of blowing it in alarms the horse.

5909. *Fever Powders.*

1.
Tartar emetic, 2 drachms.
Nitre, 5 drachms.

2.
Antimonial powder, 2 drachms.
Cream of tartar,
Nitre, of each 4 drachms.

5910. *Fever Drink.*

3.
Sweet spirit of nitre, 1 ounce.
Mindererus spirit, 6 ounces.
Water, 4 ounces.

5911. *Epidemic Fever Drink.*

4.
Sweet spirit of nitre, 1 ounce.
Simple oxymel, 6 ounces.
Tartar emetic, 3 drachms.

5912. *Malignant Epidemic Fever.*

5.
Simple oxymel,
Mindererus spirit,
Beer yeast, of each 4 ounces.
Sweet spirit of nitre, 1 ounce.

5913. *Fumigations for purifying infected Stables, Sheds, &c.,*
Manganese, 2 ounces.

Common salt, ditto.
Oil of vitriol, 3 ounces.
Water, 1 ounce.

Put the mixed manganese and salt into a bason; then, having before mixed the vitriol and water very gradually, pour them by means of tongs, or any thing that will enable you to stand at a sufficient distance, on the articles in the bason gradually. As soon as the fumes rise, retire and shut up the door close.

5914. *Hoof Liquid.*

Oil of turpentine, 4 ounces.
Tar, 4 ounces.
Whale oil, 8 ounces.

This softens and toughens the hoofs extremely, when brushed over them night and morning.

5915. *Purging Medicines.*

Balls—very mild.

Aloes, powdered, 6 drachms.
Oil of turpentine, 1 drachm.

Mild.

Aloes, powdered, 8 drachms.
Oil of turpentine, 1 drachm.

Strong.

Aloes, powdered, 10 drachms.
Oil of turpentine, 1 drachm.

The aloes may be beaten with treacle to a mass, adding, during the beating, the oil of turpentine. All spices, oil of tartar, cream of tartar, jalap, &c. are useless, and often hurtful additions.

5916. *Liquid Purge.*

Epsom salts dissolved, 8 ounces.

Castor oil, 4 ounces.
Watery tincture of aloes, 8 ounces.

Mix.—The watery tincture of aloes is made by beating powdered aloes with the yolk of egg, adding water by degrees; by these means half an ounce of aloes may be suspended in eight ounces of water; and such a purge is useful when a ball cannot be got down, as in partial locked jaw.

5917. *Scalding Mixture for Pole Evil.*

Corrosive sublimate, finely powdered, 1 drachm.
Yellow basilicon, 4 ounces.

5918. *Foot Stoppings.*

Horse and cow dung, each about 2 lb.
Tar, half a pound.

5919. *Wash for coring out, destroying Fungus, or proud Flesh, &c., &c.*

Lunar caustic, 1 drachm.
Water, 2 ounces.

5920. *Wash for Mange.*

Corrosive sublimate, 2 drachms.
Spirit of wine or brandy, 1 ounce.
Decoction of tobacco,
Ditto of white hellebore, of each 1 pint.
Dissolve the mercury in the spirit, and then add the decoctions.

5921. *Ointments for Healing.*

1.
Turner's cerate, 4 ounces.
White vitriol powdered, half a drachm.
Lard, 4 ounces.

5922. *For Digesting.*

2.
Turner's cerate, 2 ounces.
White vitriol, 1 drachm.
Yellow basilicon, 5 ounces.

5923. *For Mange.*

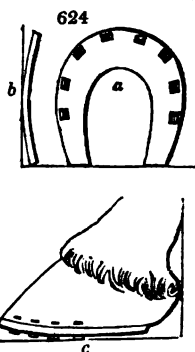
Sulphur vivum, 8 ounces.
Arsenic in powder, 2 drachms.
Mercurial ointment, 2 ounces.
Turpentine, 2 ounces.
Lard, 8 ounces.
Mix, and dress with every morning.

5924. *For Scab or Shab in Sheep, Mallenders and Sellenders in Horses, and foul Blotches and Eruptions in Cattle in general.*

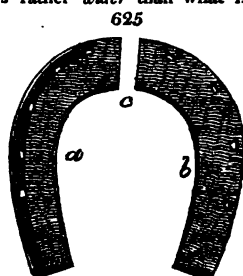
Camphor, 1 drachm.
Sugar of lead, half a drachm.
Mercurial ointment, 1 ounce.

SECT. VIII. *The Shoeing of Horses.*

5925. *The importance of the subject of shoeing to the agriculturist is sufficiently attested by the immense number of inventions which the ingenuity of philosophers and artists are every day devising, to render the system complete. Almost every veterinary professor has his favorite shoe; and we find one of the most ingenious of the present day endeavoring to force on our notice, and introduce into our stables the French method; which, with the exception of the mode of nailing on, White observes, is the very worst he ever saw. The French shoe (fig. 624 a) has a wide web towards the toe, and is concave above, and convex below (b), on the ground surface, by which neither the toe nor heel touch the ground (c); but the horse stands pretty much in the same way with an unhappy cat, shod by unlucky boys with walnut shells. But as Blaine observes, in reference to these inventions, "No one form of foot defence can be offered as an universal pattern." It is, he continues, plain that the principles of shoeing ought to be those that allow as little departure from nature as circumstances will justify. The practice also should be strictly consonant to the principles; and both ought to consist, first, in removing no parts but those which, if the bare hoof were applied to natural ground, would remove of themselves. Secondly, in bringing such parts in contact with the ground (generally speaking) as are opposed to it in an unshod state; and above all, to endeavor to preserve the original form of the foot, by framing the shoe thereto; but never to alter the foot to the defence. The shoe at present made at the forges of the most respectable smiths in the cities and large towns throughout the kingdom, if it have not all the requisites, is, however, so much improved on, that with some alterations, not difficult either to direct or adopt, is the one we shall hold up as the most eligible for general shoeing. It is not that a better might not be offered to the notice; and in fact such a one we shall present to our readers; but so averse are the generality of smiths to have any improvements forced on them, and so obstinately determined are they to adhere to the forms handed down to them by their forefathers, that their stupidity or malevolence, or both, frequently makes the improvement itself, when seemingly acquiesced in, a source of irreparable injury. It is for these reasons we would recommend to agriculturists in general, a modified shoe of the common stamp.*



5926. *The improved shoe for general use (fig. 625.), is rather wider than what is usually made. Its nail holes (a) extend no further towards the heels than is actually necessary for security; by which the expansion of these parts is encouraged, and contraction is avoided. To strengthen the attachment, and to make up for this liberty given to the heels, the nails should be carried around the front of the shoe (c). The nail holes, on the under or ground surface of the shoe (a), are usually formed in a gutter, technically called the *fullering*; but in the case of heavy treading powerful horses, this gutter may be omitted, or if adopted, the shoe in that part may be steeled. The web, should be quite even on the foot or hoof surface (b), and not only be rather wider, but it should also have rather more substance than is common: from half an inch to five eighths in thickness, according to circumstance, forms a fair proportion; when it is less it is apt, in wearing, to bend to pressure and force out the clinches. A great error is committed in setting shoes out so much wider than the heels themselves: this error has been devised to correct another, which has been that of letting horses go too long without shoeing; in which case, if the heels of the shoe were not too wide originally, as the foot grew, they became lost within the heels; and thus bruised and produced corns: but as we will suppose that few will wish to enter into a certain error to avoid an uncertain one, so we recommend that the heels of the shoe should stand only wide enough to prevent the expansion of the quarters pushing the heels of the feet over the outer edge of the heels of the shoe: for which purpose if the iron project rather less than a quarter of an inch, instead of three-eighths, or even half an inch, as it frequently does, many advantages will be gained. Whoever attentively examines a shoe well set off at the heels, as it is termed, will find only one third of its flat surface protecting the heels; the remainder projects beyond, and serves but to form a shelf to lodge dirt on; or as a convenient clip for another horse to tread on; or for the wearer to cut his own legs with; or to afford a more ready hold for the suction of clayey*

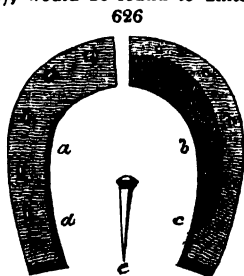


grounds to force off the shoe by. The heels of the common shoe are likewise not in general sufficiently long for the protection of the foot; and which defect, more than a want of width, causes the tendency to press on the crust of the heels. It is further to be observed, that if the decreased width of the outer standing of the heels, and the increased width of the web, should make the inner angle of the shoe heel in danger of interfering with the frog, the corner may be taken off. In forging this shoe, it may be bevelled, or left plane on both surfaces, or rather nearly so, for it is usual with most smiths to thin it in some degree towards the inner edge. This shoe is applicable to most feet, is easily formed, and as such, in country places is all that can be expected.

5927. *The injurious effects of bad shoeing* would only require to be known to excite every endeavor to obviate them; and there are some circumstances in the more common shoes of country smiths, that ought to be impressed on the mind of every agriculturist, and guarded against by every one who possesses a horse. It is too frequently observed that the ground side of their shoe is convex, and that the inward rim, when the foot is on the ground, is the lowest part; on which it is evident the weight must first press; and by which pressure, the crust will be forcibly thrust on the extreme edge of the shoe; and the only resistance offered to its being forced from it, depends on the nails and clinches, instead of its just application to the ground, and the support derived from the uniform pressure of the whole. Every shoe should therefore be perfectly level on its ground surface: nor should any shoe be put on that has not been tried on a *plane iron* purposely made for such trial; which irons are kept in some smithies, but are absent from too many. The substance of the shoe should be the same throughout, forming two parallel lines of upper and under surface; in plain language, the heels, instead of being clubbed as is too frequent, should be the exact thickness of the toe. Neither should the width at the heels diminish in the proportion it usually does; on the contrary, for a perfectly formed foot, the web should present an uniform width throughout.

5928. *Varieties in form of foot, differences in size, weight, and uses of horses*, will necessarily make deviations in the form and substance of shoes. The very shoe recommended may be considered as a variation from what would be immediately necessary, were the feet generally perfect; but it is to be considered that there are but very few feet but what have undergone some unfavorable alteration in their form, which makes them very sensible to concussion. It is for this reason, therefore, that it is recommended, that a shoe be used, for general purposes, somewhat wider and thicker than the common one. In weak, tender, flexible feet, it will be found particularly advantageous; and here the benefit of wide heels to the shoe will be most apparent. Good as the roads now are, yet most horses are occasionally subjected to travel on bad ones; some know no other: to these the addition of one, or at the most, two ounces to each shoe is nothing; but the ease to the horse, and its superior covering, as well as support, is incalculable. In very young, very light, and very firm feet, the width and substance may be somewhat diminished at pleasure, and particularly in situations where the roads are uniformly good; but a very long and extensive experience has assured us, that the shoe portrayed, is one well calculated to meet the ordinary purposes of travelling, and the present state of the art of horse shoeing.

5929. *An improved shoe on the present plan* (fig 626.), would be found to unite all the perfections of the modern English improvements, with some derived from our neighbors the French. What has since been called a *seated shoe* was introduced by Osmer; but from the obstinacy and ignorance of smiths, as it could not be brought into general use, it became little thought of, until revived by Clark of Edinburgh; by whom it was patronized and recommended. It finally was taken up by Moorcroft, and has ever since attracted some attention, and continues to be forged in some shops where the work is superiorly done; and where the employers have liberality enough to pay for such work, and judgment enough to discriminate between its advantages and those of the common shoe. If to this shoe were added the French mode of fastening it to the foot, we think the improvement would almost shut out all others. On examining the figure it will be seen that this shoe presents a flat surface opposed to the ground (a), but a concave one towards the sole (b); but that this concavity does not begin, as in some seated shoes near the outer edge, but embraces two thirds only of the web, leaving by this means a sufficient surface for the crust: but this bevelling is not intended to reach the heels; it stops short of them (c), leaving the web at this part plane for the heels to rest upon. The



great advantages of this seating are, first, that as the crust rests on a flat surface instead of an inclined plane, as most of the common forged shoes present, so its position is maintained entire, and the inclination to contraction is in a great degree avoided. The nailing on of this shoe we would recommend to be after the French method, which consists in conical nail holes, punched with a square countersink (*d*), into which are received conical nails (*e*), which exactly fill up the countersink; by which means so long as any part of the base of the nail remains, the shoe must be held firmly on, and which is not the only advantage gained; for the nail holes being obliquely formed, and at some distance from the outer rim, act less detrimentally on the crust of the foot.

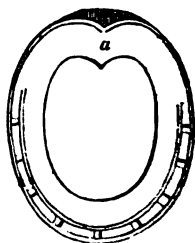
5930. *To prepare the foot for the application of the shoe is also an important consideration.* Avoid taking off more than one shoe at a time; otherwise the edges of the crust become broken away. Observe that the clinches are all carefully removed. Let the rough edges of the crust be rasped away; after which, the sole should be pared throughout until a strong pressure with the thumb can produce some yielding: too strong a sole tends to heat and contraction, too weak a one will not require paring. In this paring imitate the natural arch of the sole as much as possible. The line of concavity should not begin, as it usually is made to do, from the extreme margin of the foot, but should begin from the inner line of the crust only; by which means the crust, or outer wall of the hoof, will have a firm bearing on the flat surface of the shoe. Let no heated shoe be applied to correct the inequalities that may be left, unless it is for a moment, only to observe, but not burn them; but still more carefully avoid putting a plane shoe on an uneven foot. The portion of sole between the bars and quarters (*fig. 622 d*) should be always pared out as the surest preventive against corns. The heels also should be reduced to the general level of the foot, never allowing their hardness to serve as an excuse for being left; neither suffer the inner heel to be lowered more than the outer. After all the rest has been done, the frog should be so trimmed as to remain on an exact level with the returns of the heels, and no more. The custom of taking away the point or angle of the horny inflexions of the heels, under the false term of opening the heels, is to be carefully avoided. Let all these operations be performed with a drawing knife. The butteris should never be allowed to come near the foot of any horse but the largest and coarsest of the cart breed.

5931. *The shoes for the hind feet are somewhat different to the fore, being a little squarer at the toe for about an inch; to which squareness the hoof is to be also adapted by rasping it slightly so, avoiding, however, to do it injuriously.* By this mode a steady point of bearing is afforded to the hinder feet in the great exertions they are often called upon to make in galloping, leaping, &c. They are, when thus formed, less liable, also, to interfere with the fore shoes by clicking. When horses *click* or *over-react* very much, it is also common to square, or rather to shorten the toes of the hinder shoes; but not to do so by the horn; by which, the hoof meets the middle of the fore shoe instead of the shoe itself; and the unpleasant noise of the stroke or click of one foot against the other is avoided.

5932. *Varieties which necessarily occur in shoeing.* The bar shoe (*fig. 627.*), is the most important variety, and it is to be regretted that so much prejudice prevails against the use of this shoe, which can only arise from its supposed unsightly appearance as betokening unsoundness. As a defence to weak thin feet it is invaluable, as it removes a part of the pressure from the heels and quarters, which can ill bear it, to the frog which can well bear it; but a well formed bar shoe should not have its barred part raised into an edge behind, but such part should be of one uniform thickness throughout the web of the bar, which, instead of being the narrowest, should be the widest part of the shoe. The thickness of the bar should be greater or less (*a*), so as to be adapted to take only a moderate pressure from the frog. When the frog is altogether ulcerated away by thrush, the bar may be altogether plain; but this form of shoe is still the best for these cases, as it prevents the tender surface from being wounded. In corns this shoe is invaluable, and may then be so made as to lie off the affected part, which is the great desideratum in corns.

5933. *The hunting shoe is made lighter than the common one, and it is of consequence, that it is made to sit as flat to the foot as it can safely do without pressing on the sole: by which the great suction in clayey grounds is much lessened.* Hunting fore shoes should also be as short at the heels as is consistent with safety to the foot, to avoid the danger of being pulled off by the hinder shoes: nor should the web project at all. It is the custom to turn up the outer heel to prevent slipping; which is done sometimes to both fore and hind feet, and sometimes only to the latter. As this precaution can hardly be avoided in hilly slippery grounds, it should be rendered as little hurtful

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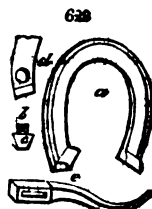


as possible by making the tread equal; to which purpose, thicken the inner heel and turn up the outer. This is better than lowering the outer heel to receive the shoe, which still leaves both the tread and foot uneven.

5934. *The racing shoe, or plate*, is one made as light and slender as will bear the weight of the horse, and the operations of forging, grooving, and punching: to enable it to do which, it ought to be made of the very best Swedish iron. Three, or at most four nails, are sufficient on each side; and to avoid the interfering of the hind with the fore feet, the heels of the fore shoes are made as short as they can safely be. As racers are shod in the stable, the owners should be doubly careful that the plate is an exact fit. Many pairs ought to be brought and tried before any are suffered to be put on, and which is more important than is at first considered.

5935. *Grass shoes or tips* are very short pieces placed on the toe alone, in horses turned to grass in summer; at which time they are essentially necessary to guard the fore feet, which otherwise become broken away, and irretrievably injured. They should be looked at occasionally to see that they do not indent themselves into the soles.

5936. *Frost shoes*, (fig. 628 a) have the ends turned up to prevent the foot from sliding; unless the turning up or calkin be hardened, they soon wear level and require to be renewed, to the injury of the foot by such frequent removals. To remedy this, many inventions have been tried; one of the best of these is that of Dr. Moore, in which the frost clip is made distinct and moveable by means of a female screw (b) worked in it, to which a knob or wedge (c), and male screw (d) are adapted; a key (e) being used for fixing or removing it.



5937. *High calkins*, or turn ups, however objectionable in general shoeing, yet, in precipitous counties, as those of Devonshire, Yorkshire, and of Scotland, &c., are absolutely necessary for their draught horses. It greatly obviates the evils of uneven pressure, if a calkin be also put to the toe; and it would be still better were these calkins steeled, particularly the fore ones.

5938. *The shoeing of diseased feet* is necessarily very various, and is too often left to the discretion of the smith, by which the evils themselves are greatly aggravated, if he be ignorant. The most prominent alterations for these purposes will be found described under the respective diseases of the feet requiring them.

5939. *Horse pattens* are in use by some cultivators who occupy soft or mossy soils. Those esteemed the best are constructed of alder or elm, and are fixed to the hoof by means of three links and a staple, through each of which passes a leathern strap that goes twice round the hoof, and is fastened by a buckle. The staple is placed behind the patten, which is ten inches one way, by ten and a half the other. The links are about three inches in length, and rivetted through pieces of hoop iron to prevent the wood from splitting. After numerous trials it has been found that pattens made in this way, answer the purpose better than any other kind. (*Farm. Mag.*)

SECT. IX. Criteria of the Qualities of Horses for various purposes.

5940. *The general criteria of the qualities of a horse* are derived from inspection and trial. His outward appearance among judges affords a pretty just criterion of his powers, and a moderate trial usually enables the same judgment to decide on the disposition to exercise such powers.

5941. *The criteria of a horse derived from his color* have been already noticed. (5629.) As a general principle dark are preferable to light horses, except in the instance of black, which has fewer good horses within its range, particularly in the lighter breeds, than any other. Grey horses are also, in some degree, an exception to the rule; for there are many good greys. Bay and brown are always esteemed colors.

5942. *The criteria of action* are derived from a due consideration of the form generally, and of the limbs particularly; as well as from seeing the horse perform his paces in hand.

5943. *The criteria of hardihood* are derived from the form of the carcase, which should be circular, or barrelled; by which, food is retained, and strength gained, to perform what is required. Such horses are also generally good feeders.

5944. *The criteria of spirit, vigor, or mettle*, as it is termed, are best derived from trial. It should always be kept in mind, that a hot fiery horse is as objectionable as a horse of good courage is desirable. Hot horses may be known by their disinclination to stand still; by their mettle being raised by the slightest exercise, especially when in company. Such horses seldom last long, and under accident are impetuous and frightened in the extreme. A good couraged horse, on the contrary, moves with readiness as well alone as in company: he carries one ear forward and one backward; is attentive and cheerful, loves to be talked to, and caressed even while on his journey; and

If in double harness, will play with his mate. Good couraged horses are always the best tempered, and, under difficulties, are by far the most quiet, and least disposed to do mischief.

5945. *The criteria of a race-horse*, derived from form, are, that he have the greatest possible quantity of bone, muscle, and sinew, in the most condensed form. There should be a general length of parts to afford stretch, scope, and elasticity, with great muscles hardened by condition, to act on the length of these parts advantageously. In particular his hind-limbs should be furnished with ample thighs, and broad hocks, which should be low set. His fore arm ought also to be broad, and the knee, like the hock, should be near the ground.

5946. *The criteria of a hunter* are, that he have somewhat similar proportions with the racer, but with more bulk to enable him to continue his exertions longer, and to carry more weight. In him, a good carcass is essentially necessary to fit him to go through a long chase; and the more, if he be required to hunt more than one or two days in the week. Some light carcassed horses will do one day's hunting work a week very well; but knock up at more. The hunter should be well formed in his loins, and well let down in his thighs to propel him forward in his gallop, and give him strength to rise sufficiently to cover his leaps. It is also of great use to a hunter to be a good trotter; many such horses, when fatigued, break out of the gallop and relieve themselves by trotting, particularly over heavy ground.

5947. *The criteria of a hackney*. If it be necessary that the hackney be well formed behind to give him strength, and to propel him forward, it is even of more consequence that he be well formed before; and in this kind of horse the hind parts are in some measure subordinate to the fore, as safety is preferable to speed. The head in the hackney should be small, and well placed on a neck of due length and substance to make a proper appui for the bridle; and that proper resistance to the hand, so pleasant to the feel, and so necessary for ease and safety. The shoulders should be oblique and well furnished with muscle, but not heavy; and the withers in particular should be high. The elbows should be turned rather out than in, and the legs should stand out straight, and by no means fall under the horse, or it betokens a stumbler. The pasterns should neither be too oblique, which bespeaks weakness; nor too straight, which wears the horse out, and is unpleasant to the rider. The carcass should be round, or the horse will be washy and weak; the loins straight, wide, and ribbed home; the thighs of good substance; and although the being cat-hammed, or having the hocks turned inwards, is defective in beauty, it often bespeaks a trotter.

5948. *The criteria of a cavalry horse* are, that he have considerable extension of bulk or size, to enable him to carry weight, with good carcass to allow him to feed coarsely, and yet thrive at piquet or on service. He should have also liberty of action; but great speed is not requisite. The best cavalry horses are those formed of the united properties of hackneys, and very light draught horses.

5949. *The criteria of road horses for quick draught*, or coach, chariot, stage and post chaises, &c., are derived from the immediate purposes for which they are intended; as requiring either strength or speed in greater proportions. To make them safe, the fore-hand should rise, the back should be straight, the step should be short but quick, which fatigues least. As they approach the hunter in form, they are best fitted for quick work; and as they resemble the best kind of light agricultural horses, they are calculated for heavy draught, as coaches, &c. But in all, a portion of blood gives courage, durability, and condenses strength into lessened bulk; by which activity is gained. It is of great consequence to a coach-horse that the neck and head be so formed as to be enabled to rein-in well to the bridle.

5950. *The criteria of a dray-horse* are, that he be very broad-breasted and muscular, and thick in the shoulders, which should not lie backward. Nor should the fore-hand be up, as recommended in the road-horse; for, by holding up their heads, such horses may be choked by the collar, as they would, if so formed, draw too much by the throat, and their wind being thus stopped, would be in danger of falling down. The neck of a dray-horse is not the better for being long, and the head should be proportionate to it. Like all horses, he should be chosen with short legs, and good strong hoofs. He ought to be thick in his thighs, and large in bone; but above all, he ought to be a steady collared horse, with courage to make him true to a severe pull; and yet, without a hot fiery spirit to make him fretful.

5951. *The criteria of a waggon-horse* are, in some respects, different from those of the dray-horse. He should be more weighty, and altogether larger. Rapidity of motion is greatly subordinate, in the heavy stage-waggons usually seen on our roads, to strength. It is all collar work; nothing is gained from the momentum of the dragged mass, which, the instant the pull ceases, stands still. The waggon horse should be patient in the extreme; willing to lie to his collar up hill, and yet settle into his own share of work on level ground. As his exertions are constant, it is of the greatest consequence that he be a good feeder.

5952. *The criteria of a horse peculiarly adapted to the labors of agriculture*, are thus given by Culley. His head should be as small as the proportion of the animal will admit; his nostrils expanded, and muzzle fine; his eyes cheerful and prominent; his ears small, upright, and placed near together; his neck, rising out from between his shoulders with an easy tapering curve, must join gracefully to the head; his shoulders, being well

thrown back, must also go into his neck (at what is called the points) unperceived, which perhaps facilitates the going much more than the narrow shoulder; the arm, or fore-thigh, should be muscular, and tapering from the shoulder, to meet a fine, straight, sinewy, and bony leg; the hoof circular, and wide at the heel; his chest deep, and full at the girth; his loins or fillets broad and straight, and body round; his hips or hooks by no means wide, but quarters long, and the tail set on so as to be nearly in the same right line as his back; his thighs strong and muscular; his legs clean and fine-boned; the leg-bones not round, but what is called *lathy* or flat.

5953. *The chief points in a farming cart-horse*, in the opinion of the author of the *New Farmer's Calendar*, are, "neck not long, nor too thick; short legs, rather flat than round and gummy; fore-feet even, not too distant; wide chest; strong, but not high, shoulders; considerable length of waist, supported by a wide loin; quarters full, and rather raised; strong muscular thigh; size, fifteen hands one inch, to sixteen hands high. Being somewhat forelow, gives them an advantage in draught; and a moderate length of waist insures speed in the walk.

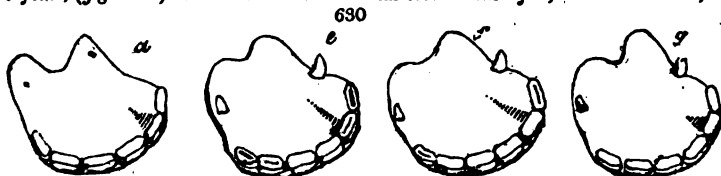
5954. *The horse used in husbandry*, according to the writer of the *Experienced Farmer*, ought to be larger, but in other respects like the road horse; and, instead of walking two or three miles an hour, be able to walk four or five. In that case he would be able both to plough more land in a given time, and work in the cart or wagon with more dispatch, when wanted. In harvest time, a nimble and strong horse is valuable. In drawing manure into the field, or corn to the market, the farmer will also find his account in strength and activity; for, as the draught in all these cases is light one way, such horses would do their business with speed. The small farmer need not with this kind of horse keep an idle one; he might carry his master to market, and plough the remainder of the week.

5955. *In a horse for the plough*, according to Brown, both strength and agility are required; a dash of blood, therefore, is not disadvantageous. It is not size that confers strength, the largest horses being often soonest worn out. A quick even step, an easy movement, and a good temper, are qualities of the greatest importance to a working horse; and the possession of them is of more avail than big bones, long legs, and a lumpy carcass. To feed well is also a property of great value; and this property, as all judges know, depends much upon the shape of the barrel, deepness of chest, strength of back, and size of the hips or hooks with which the animal is furnished. If straight in the back, and not over short, high in the ribs, and with hooks close and round, the animal is generally hardy, capable of undergoing a great deal of fatigue, without lessening his appetite, or impairing his working powers; whereas horses that are sharp pointed, flat ribbed, hollow backed, and wide set in the hooks, are usually bad feeders, and soon done up when put to hard work.

5956. *The criteria of a horse's age* are derived from the appearance of the teeth. According to La Fosse the younger, there are these appearances. The horse is foaled with six molar or grinding teeth in each jaw (*fig. 629 a*); the tenth or twelfth day after, the



two front nippers (*a*) appear above and below, and in fourteen or fifteen days from this, the two intermediate (*b b*) are pushed out; the corner ones (*c c*) are not cut till three months after. At ten months the incisive or nippers are on a level with each other, the front less than the middle, and these again less than the corners; they at this time have a very sensible cavity (*d*). At twelve months this cavity becomes smaller, and the animal appears with four molar teeth on each side, above and below, three of the temporaneous or colts', and one permanent or horse tooth: at eighteen the cavity in the nippers is filled up, and there are five grinders, two of the horse, and three temporaneous; at two years, (*fig. 630.*) the first of the colts' molar teeth in each jaw, above and below, are



displaced: at two years and a half, or three years, the front nippers fall and give

place to the permanent ones: at three and a half the middle nippers are likewise removed; at which period the second milk-molar falls: at four years, the horse is found with six molar teeth, five of his new set, and one of his last: at four years and a half the corner nippers of the colt fall and give place to the permanent set (*fig. 629 e*), and the last temporary grinder disappears: at five years old the tushes in the horse usually appear: at five and a half they are completely out, and the internal wall of the upper nippers, which before was incompletely formed, is now on a level with the rest; at this period the incisive or nippers have all of them a cavity formed in the substance between the inner and outer walls, (*fig. 629 f*) and it is the disappearance of this that marks the age: at six years those in the front nippers below are filled up, (*fig. 630 e*) the tushes are likewise slightly blunted: at seven years the mark or cavity in the middle nippers is filled up, and the tushes a little more worn (*fig. 630 f*): at eight years old the corner nippers are likewise plain, and the tushes are round and shortened. (*fig. 630 g*) In mares, the incisive or nippers alone present a criterion (*fig. 630 a*); at this period the horse is said to be aged, and to have lost his mark; but among good judges the teeth still exhibit sufficient indications. At nine the groove in the tushes is worn away nearly, and the nippers become rather rounded: at ten these appearances are still stronger: at twelve the tushes only exhibit a rounded stump, the nippers push forward, become yellow, and as the age advances, appear triangular and usually uneven.

5957. *M. St. Bel*, the late professor of the English Veterinary College, used to assert, that after eight years the cavities in the anterior or upper incisive teeth, are filled up with equal regularity; thus from eight to ten the front ones were filled up, from ten to twelve the two middle, and from twelve to fourteen those of the corner; but though some pains have been taken to ascertain this, it does not appear that the disappearance of the cavities in these teeth is attended with sufficient regularity to warrant complicit confidence.

5958. *To make a colt appear older than he really is*, both breeders and dealers very commonly draw the nippers, particularly the corner ones; by which means the permanent set which are underneath immediately appear, and the animal is thus fitted for sale before he otherwise would be.

5959. *To make a horse look younger than he really is*, dealers perform an operation on the teeth called *blebopping* (from the name of a noted operator); which consists in making an artificial cavity in the nippers, after the natural one has been worn out by age, by means of a hard sharp tool; which cavity is then burned black by a heated instrument. But no art can restore the tushes to their form and height, as well as their internal grooves. It is, therefore, common to see the best judges thrust their finger into a horse's mouth, contenting themselves with merely feeling the tush. To less experienced judges other appearances present themselves as aids. Horses, when aged, usually become hollow above the eyes, the hoofs appear rugged, the under lip falls, and if grey, they become white. In this country, where horses are so early worked before the frame is consolidated, and where afterwards they continue to be exerted unceasingly on hard roads, it is not uncommon to find a horse at six years old, feeble, debilitated, and exhibiting all the marks of old age, except in his mouth; on the contrary, when the animal falls into other hands, at ten or twelve he has all the vigor of youth, and his teeth are the only parts that present an indication of age: it is, therefore, more useful to examine the general appearance of the animal, than to be guided altogether by the marks in the teeth; a too strict adherence to which, Blaine observes, leads into great error on the subject of the age of horses. The commonly received marks, he says, grant not a criterion of a third of the natural life of the animal, nor of one half of the time in which he is perfectly useful. Many good judges will not purchase a horse for hunting earlier than eight years old, and regard him only in his prime at twelve. A gentleman at Dulwich has a monument to the memory of each of three several horses, which died in his possession at the age of thirty-five, thirty-seven, and thirty-nine years; the latter of which was suddenly taken off by a fit of colic, having been in harness but a few hours before. Culley mentions a horse of forty-five; and an instance lately occurred of one which lived to fifty. Blaine, in continuation, draws the following comparison between the relative situations of the state of the constitution, between the horse and man, under the ordinary circumstances of care towards each. The first five years of the horse, may be considered as equivalent to the first twenty of a man; a horse of ten as a man of forty; of fifteen as a man of fifty; of twenty as a man of sixty; of twenty-five as a man of seventy; of thirty as a man of eighty; and of thirty-five as a man of ninety. (*Vet. Outlines*, p. 35.)

SECT. X. Of Breeding Horses.

5960. *The general principles of breeding* we have already laid down at length, (1994.), and have here to notice what are considered the best practices in the choice of stallions and mares, and in the treatment of the latter during pregnancy. Unfortunately, however, much less attention has been paid to breeding horses, than to breeding cattle or sheep; though, as Brown has observed, a pound of horse flesh is worth two of that of any other stock; and it costs just as much to breed a bad horse as a good one. Every one, an eminent writer observes, exercises some degree of judgment in regard to the stallion; but there are few breeders, comparatively, who hesitate to employ very ill-formed and worthless mares, and often solely because they are unfit for any thing else than bringing a foal. All the best writers on agriculture reprobate this absurd and unprofitable practice. "In the midland counties of England, the breeding of cart horses is attended to with the same assiduity as that which has of late years been bestowed on cattle and sheep; while the breeding of saddle horses, hunters, and coach horses is almost entirely neglected; or left almost wholly to chance, even in Yorkshire, — I mean as to females. A breeder here would not give five guineas for the best brood mare in the kingdom, unless she could draw or carry him occasionally to market; nor a guinea extraordinary for one which could do both. He would sooner breed from a rip, which he happens to have upon his premises, though not worth a month's keep. But how absurd! The price of the leap, the keep of the mare, and the care and keep of her progeny, from the time they drop to the time of sale, are the same, whether they be

sold from ten to fifteen, or from forty to fifty pounds each." (*Marshal's Economy of Yorkshire*, vol. ii. p. 166.)

5961. *In those districts where the breeding of horses is carried on upon a large scale and a regular plan*, the rearing of stallions forms in some degree a separate branch; and is confined, as in the case of bulls and rams, to a few eminent breeders. These stallions, which are shown at the different towns in the vicinity, sometimes sent to be exhibited at a considerable distance, are let out for the whole season, or sold to stallion men, or kept by the breeder himself, for covering such mares as may be offered, at a certain price per head; and this varies according to the estimation in which the horse is held, and sometimes according as the mare has more or less of what is called blood. For farm mares, the charge for covering by a stallion of the same kind is commonly about a guinea, with half-a-crown to the groom; and it is a common practice in the north, to agree for a lower rate if the mare does not prove with foal; sometimes nothing more is paid in that case than the allowance to the groom.

5962. *In choosing the parents*, or stallion and mare, regard must be had to the kind of stock desired to be bred. Whatever may the particular purpose of the breed, a stallion ought first to possess all the general properties of a good horse, and next the characteristic criteria of the desired stock. The produce, whether a male or female, much more frequently acquires and retains the form, make, marks, and disposition of the sire than the dam. On this account, stallions with the least appearance of disease, blemish, or bodily defect of any kind, where there is the slightest probability of its being transmitted to the offspring, should be rejected as improper. And it is even considered by some, necessary to descend to the minutiae of symmetry in the head, neck, shoulder, forehead, ribs, back, loins, joints, and pasterns, attending even to a strict uniformity in the form, make, and texture of the hoofs: and, were it possible, even to ascertain the temper and disposition of both sire and dam, in order to avoid the procreation of vices or imperfections. But provided either parents be free from hereditary infirmities, disorders which arise from accident are of no consequence.

5963. *The general properties required in a breeding mare*, are a good shape, a gentle disposition, a large carcass conformably to her height, and belly well let down; she must be perfectly free from all sorts of blemishes and defects. The size, frame, bone, strength, and blood, will of course be regulated by the purposes of the breeder.

5964. *The mare which is intended to supply draught-colls* should, according to the author of the *Synopsis of Husbandry*, be large limbed, close jointed, short decked, wide chested, home ribbed, with a capacious body; her eyes good, and her nostrils large and open; in disposition she ought to be gentle and tractable; of a constitution healthy and vigorous, free from any blemishes either hereditary or acquired. The horse should be bold and spirited, well made, and of a kindly disposition; his constitution should be strong, his temper good, and, in short, neither in mind or body ought he to be contaminated with vices or disease of any kind; since on the good qualities and strength of constitution in the sire and the dam depends, in a great measure, the future welfare of the colt.

5965. *The age at which a stallion and mare should be allowed to copulate* is not determined by uniform practice; and is made to depend, in some measure, on the degree of maturity, which, in animals of the same species, is more or less early, according to breed and feeding. Yet it would seem, in general, to be an improper practice to allow animals of any kind to propagate, while they are themselves in a raw unformed state, and require all the nutriment which their food affords, for raising them to the ordinary size of the variety to which they belong. It may, therefore, be seldom advisable to employ the stallion till he is about four years old, or the mare till she is a year older, and if the stallion be five also it is better, and still more so if he be six or seven. But the greater number of mares left for breeding are not very young; being in many cases, not allowed to bring foals till they are in the decline of life, or otherwise unable to bear their full share in rural labor.

5966. *Three months before a stallion is to cover a mare*, he should be fed with sound oats, peas, or beans, or with coarse bread, and a little hay, but a good quantity of wheat straw; he should be watered regularly, and have long continued walking exercise every day, but he should not be over heated. If he be not prepared and put in condition, the colts will be likely to be weakly, and the horse himself will become injured, begetting humors, or becoming broken winded. If he be put to too many mares, he will not last long; his main and tail will begin to fall off through weakness, and it will be difficult to get up his flesh again by the next year. The number of mares should be proportioned to his strength, and twelve, fifteen, or at the most twenty are as many as a horse will well serve for in a season.

5967. *The usual season when a mare takes the horse* is from the beginning of April to the beginning of July. The month of June is considered the best season in this country; although from the middle to the end of May is more approved of on the Continent, particularly in Normandy, where the farmers devote much of their attention to this branch of husbandry; and in which, especially in regard to useful farm horses, they have succeeded, perhaps, beyond those in any other part of Europe. This difference, as to the time when a mare should be allowed to take the horse, in the different

countries, is easily reconcileable: a mare goes eleven months and a few days with foal; and the great object with all farmers, where practicable, is to have her covered at such a period as to ensure abundance of grass, and the return of warm and comfortable weather at the period of foaling. An early colt is always to be preferred to one that falls late in the season. It is generally understood, and is an opinion that is believed to be well founded, that a mare may be covered on the ninth day after she has foaled, with a greater degree of success than at any other period. This practice is, of course, often followed; but in such cases the mare ought, Donaldson thinks, to be fed in an extraordinary manner, otherwise it is impossible she can do justice to her present and her future foal. But modern farmers would probably, he says, come nearer their purpose, were they to follow the example of the Romans, and content themselves with one foal in the two years.

5968. *At the season of parturition, there should be a suitable supply of food for the mother and young.* The time of covering mares ought, therefore, to be partly regulated by a due regard to this circumstance, and may be earlier in the south than in the north, where grass, the most desirable food both for the dam and foal, does not come so early by a month or six weeks. In Scotland, it is not advantageous to have mares to drop their foals sooner than the middle of April; and as the period of gestation is about eleven months, they are usually covered in May, or early in June. But if mares are intended to bring a foal every year, they should be covered from the ninth to the eleventh day after foaling, whatever may be the time; and the horse should be brought to them again nine or eighteen days afterwards.

5969. *In breeding horses on a large scale, it is easy to contrive so that all the foals may be brought forth at a time when there is plenty of grass.* About the end of May the mares are to be put into an enclosure capable of feeding them as long as the stallion is to be with them, or that they are in season. In this enclosure all the mares are to be put together, as well those which are barren as others. The stallion's hind shoes are to be taken off, but the fore shoes should be left, or tips put on to preserve his feet; then lead him forth, and let him cover a mare twice in hand, to render him more tame and gentle. After this take off the bridle and turn him loose among the rest, where he will become familiar with them, and not one of them will be horsed but when they are in season. There should be a little lodge built up in some part of the enclosure, and peas, beans, oats, bread, and other good food, put into the manger in it, that the horse may retire into it in the scorching heats, and eat what he likes best. He must be thus entertained during the whole time he is with the mares, which is to be about six or seven weeks. Mares that are very fat and gross do not hold well; but those which are moderately fat conceive with the greatest success and ease.

5970. *To bring a mare in season, it is a common thing to give her a quart of hemp-seed, or twice that quantity, night and morning, for eight days before she is brought to the horse.* If she refuse it alone, it may be mixed with beans or oats, and will go down; and if the stallion eat of it also, it will force him also; but it must be remembered that these provocatives are unnatural, and often defeat their own purposes. They are therefore seldom now resorted to among intelligent breeders. Still more improper is it to attempt an early horsing, by injecting stimulating fluids up the vagina as is sometimes done; for when it succeeds, the future progeny seldom answers the expectation.

5971. *The treatment of a pregnant mare is in general little different from that of any other horse.* Mares of draught are worked in summer as usual, and more moderately in the ensuing winter, till near the time of foaling; when, if the season be somewhat advanced, even though the pasture be not fully sufficient for their maintenance, they should be turned out to some grass field near the homestead, and receive what additional supply of food may be necessary under sheds adjoining. It is both inconvenient and dangerous to confine a mare about to foal in a common stable, and still more so to leave her loose in a close stable among other horses; and confinement is not much less objectionable after dropping her foal.

5972. *Breeding mares are usually worked through the greatest part of the year, laying them aside only for a week or two before foaling, and during the summer season, when giving suck to the young foal.* In this way, Brown observes, the strength and vigor of the mother is not only weakened, but the size and power of the foal stand a great chance of being diminished, by the exertions of the mother when kept at work. Under these impressions we are led to consider the working of breeding mares as an unprofitable practice. Were they suffered to remain at ease, to roam upon coarse pastures, where sheds were erected in which they might find shelter during inclement weather, we are almost certain that their progeny would enter upon action with increased abilities. The expense of a breeding mare kept in this way would not be great, whilst the advantages would be innumerable. In Yorkshire, and in those midland counties where the breeding and rearing of horses is better understood than in any other part of the island, they are often worked till the very time of foaling. Great care, however, is necessary in working and managing a mare heavy with foal: an over-heat, too severe exercise, a fright, or a sudden and violent jerk, are very apt to cause an untimely birth, whereby the foal is lost, and the life of the mare very much endangered.

5973. *In the mountains of Wales, and in the Highlands of Scotland, the breeding mares are never worked during the summer. They are driven to the hills and mountains at the close of the barley-seed season, where they remain till the inclemency of the weather forces them to return for shelter. But their scanty subsistence, the labor they are subjected to in procuring their food, and the moistness and coldness of the climate in the latter part of the season, render both themselves and their progeny of but little value or importance.*

5974. *Breeding farms, consisting chiefly of pasture land unfit for feeding, are the situations where breeding is generally carried on. Arable farmers may breed occasionally; but the inconvenience of wanting any part of their working stock at the time of foaling operates almost as a prohibition to the breeding of horses. The greater number of horses are bred in situations where a small portion of arable land is attached to farms chiefly occupied with cattle or sheep; or where the farms are so small as not to afford full and constant employment to the number of horses that must, nevertheless, be kept for the labor of particular seasons.*

SECT. XI. Of Rearing Horses.

5975. *Rearing includes the treatment of the foal till it is fit to work, or to be put in training for use, and also the treatment of the mother till she has weaned her foal.*

5976. *In regard to the treatment of the mare till she has weaned her foal in England, and in the improved parts of Scotland, a mare after having foaled, is turned, together with the foal, into a pasture field, and is allowed two or three weeks' rest, before she is again worked, either in plough or cart; the foal being allowed to suckle at pleasure during the time. After having had a few weeks' rest, she is again worked in the usual manner; the foal being commonly shut up in a house during the hours of working. In Yorkshire, some farmers are particularly careful not to allow the mare to go near the foal, after her return from labor, till her udder has been bathed with cold water, and not till most of the milk is drawn from it. These precautions are used with a view of preventing any bad consequences from the foal's receiving over-heated milk. Another practice, and which is superior to the above, is also common in Yorkshire, and in many parts of Scotland: — after the foal is a few weeks old, and has acquired strength and agility enough to follow its mother, it is allowed to attend her in the field during the hours of labor, and to suckle occasionally. By this means, not only does the foal receive sufficient exercise; nor can any prejudicial effect happen from the over-heated state of the milk, as the foal is allowed to draw it off repeatedly, and at short intervals; but the little animal becomes hardy, and loses all timidity, and afterwards requires less breaking; these may be considered as the general modes of management in those parts of the kingdom mentioned above, during the period while the foal is allowed to suckle its dam, which is usually about six months; that is, from the time of foaling, till Michaelmas, which is the period at which foals are generally weaned, or prevented from sucking. Breeding mares are evidently unable to endure the fatigue of constant labor, for some months before and after parturition: this had led a few farmers to rear foals upon cow milk; but the practice is neither common nor likely ever to become so: and as it is a philosophical fact, well established, that all animals partake, in some measure, of the nature of their foster parent, so there is great reason to fear this practice would prove injurious to foals so reared.*

5977. *In weaning the foal at the end of six or seven months, great care should be taken to keep the mare and foal from the hearing of each other, that neither may fret or pine after the other. The best method will be to confine the foal in a small stable by itself, which should be furnished with a rack and manger, where it may be fed with clean shaken hay, and clean sifted oats, bruised a little in a mill, or chopped carrots, or boiled potatoes. With this management, he will quickly forget his dam, and become gentle and familiarised to his keeper, and in fair weather may be suffered to exercise himself in a pasture adjoining to the stable; but this should be only for a little while in the middle part of a sunny day; the tenderness of the young animal rendering it dangerous to keep him out in the night.*

5978. *The treatment of weaned foals in England, is to put them immediately into a good fresh pasture, where they remain as long as the winter continues moderate. On the approach of winter, they are fed with a sufficient quantity of hay, placed in a stable or hovel, erected in the field for the purpose, and into which they have free access at all times. The next summer they are put into other pastures, commonly the most indifferent on the farm, where they remain till the beginning of the following winter, when they are either allowed to range in the pasture fields, or brought home to the straw-yard. The inclemency of the winter in Scotland, and the great falls of snow which generally take place, render it necessary always to house the foals there during that season.*

5979. *During the first winter foals are fed on hay with a little corn, but should not be constantly confined to the stable; for even when there is nothing to be got on the fields, it is much in their favor to be allowed exercise out of doors. A considerable proportion of succulent food, such as potatoes, carrots, and Swedish turnips (oil cake has been recommended), should be given them through the next winter,*

and bean and peas meal has been advantageously substituted for oats, which, if allowed in a considerable quantity, are injurious to the thriving of the young animal, from their heating and astringent nature.

5980. *During the following summer* their pasture depends upon the circumstances of the farms on which they are reared. In the second winter they are fed in much the same manner as in the first, except that straw may be given for some months instead of hay; and in the third winter, they have a greater allowance of corn, as they are frequently worked at the harrows in the ensuing spring. (*General Report of Scotland*, vol. iii. p. 183.) When about three years old, the author of the *New Farmer's Calendar* advises foals to be fed all winter with a little corn twice a day, or carrots, with hay, oat-straw, &c. allowing a well-littered shed, or warm straw-yard. Colts fed at home with green meat, cut during summer, should have a daily range on a common, or elsewhere, for exercise. Yearlings to be carefully kept separate from the milch mares.

5981. *The time for gelding colts* is usually the same in both parts of the kingdom, which is, when they are about a year old; although, in Yorkshire, this operation is frequently suspended till the spring of the second year, especially when it is intended to keep them on hand, and without employing them in labor till the following season. Parkinson disapproves of delaying this operation so long, and recommends twitching the colts, a practice well known to the ram-breeders, any time after a week old, or as soon after as the testicles are come down; and this method, he says, he has followed himself, with great success. (*Parkinson on Live Stock*, vol. ii. p. 74.) Blaine's remarks on the subject of castration appear worthy of notice: he says, when the breed is particularly good, and many considerable expectations are formed on the colt, it is always prudent to wait till twelve months: at this period, if his fore parts are correspondent with his hinder, proceed to castrate; but if he be not sufficiently well up before, or his neck be too long and thin, and his shoulders spare, he will assuredly improve by being allowed to remain whole six or eight months longer. Another writer suggests for experiment, the *spaying* of mares, thinking they would work better, and have more wind than geldings. (*Marshall's Yorkshire*, vol. ii. p. 169.) But he does not appear to have been aware that this is by no means a new experiment: for Tusser, who wrote in 1562, speaks of *gelding fillies* as a common practice at that period. The main objection to this operation is not that brood mares would become scarce, as he supposes, but that, by incapacitating them from breeding in case of accident, and in old age, the loss in this expensive species of live stock would be greatly enhanced. An old or lame mare would then be as worthless as an old or lame gelding is at present.

5982. *The rearing of horses* is carried on in some places in so systematical a manner, as to combine the profit arising from the advance in the age of the animals, with that of a moderate degree of labor, before they are fit for the purposes to which they are ultimately destined. In the ordinary practice of the midland counties, the breeders sell them while yearlings, or perhaps when foals, namely, at six or eighteen months old; but most generally the latter. They are mostly bought up by the graziers of Leicestershire, and the other grazing parts of that district, where they are *grown* among the grazing stock until the autumn following. At two years and a half old, they are bought up by the arable farmers, or dealers of Buckinghamshire, Berkshire, Wiltshire, and other western counties, when they are broken into harness, and worked till they are five, or more generally, six years old. At this age the dealers buy them up again to be sent to London, where they are finally purchased for drays, carts, waggons, coaches, the army, or any other purpose for which they are found fit. (*Marshall's Economy of the Midland Counties*, vol. i. p. 311.)

5983. In the west of Scotland, a similar mode of transferring horses from hand to hand, is common. The farmers of Ayrshire, and the counties adjacent, who generally grow corn on not more than one-fourth, or at the most, one-third of their arable land, and occupy the remainder with a dairy stock, purchase young horses at the fair of Lanark and Carnwath, before mentioned; work them at the harrows in the following spring when below two years old; put them to the plough next winter, at the age of two and a half, and continue to work them gently till they are five years old, when they are sold again at the Rutherglen and Glasgow markets at a great advance of price, to dealers and farmers from the south-eastern counties. A considerable number of horses, however, are now bred in the Lothians, Berwickshire, and Roxburghshire, the very high prices of late having rendered it profitable to them, even upon good arable ground; but many farmers of these counties, instead of breeding, still prefer purchasing two and a half or three and a half year old colts, at the markets in the west country, or at Newcastle fair, in October; they buy in a certain number yearly, and sell an equal number of their work horses before they are so old as to lose much of their value, so that their stock is kept up without any other loss than such as arises from accidents; and the greater price received for the horses they sell, is often sufficient to cover any such loss. (*General Report of Scotland*, vol. iii. p. 182.)

SECT. XII. *Of Training Horses.*

5984. *Horses are trained for various purposes*, but principally for carrying our persons or drawing our burdens. Formerly, burdens were principally borne on the back by pack-horses, but the improvements in our roads have removed them from the back, to machines called carriages, drawn by means of harness applied over the person of the horse. Under saddle, we train horses as racers, hunters, hacknies, or troop horses. In harness we use them in coaches, stages, chariots, and various lighter vehicles, or we employ them in waggons, carts, ploughs, and various other agricultural or commercial machines. Horses are held in obedience by means of bridles, with appendages called reins, which are long or short, as used in riding or driving. Horses are directed and urged forward by whip, spur, and language, and they are chastised by the same means.

5985. *The directive language used to horses ought to be everywhere the same*, which is the more easily accomplished, as words or phrases are sufficient for giving every requisite direction to a horse. The first of these words may be "on," or go on, or merely the common chuck of the tongue, &c. as used by all coachmen in the world; the second to make the horse go to the right-hand side, "right-hand;" the third, to the left-hand side, "left-hand;" the fourth to make them stop, may be "stop," or "stand still." Any attempt to modify these directions, ought to be given in the correct language of the country, and not in provincial words, as go on, slowly, briskly, right-hand, a little round, or turn, left-hand, a little, or left-hand and round, stop, or stand gently, &c. As a proof that only four words are requisite for giving every requisite direction to horses, we may mention that foreigners in Stockholm, Petersburg, and Moscow, who know nothing of the language, require only four corresponding words of Swedish or Russian, to direct the native coachmen and sledge drivers to any street, house, or place, the situation of which they know by the maps, or otherwise.

5986. *The three natural and ordinary movements of horses are*, walking, trotting, and galloping, to which, some horses naturally add another, which is known by the name of "ambling," or "pacing;" the trot is, perhaps, the most natural motion of a horse, but the pace, and even the gallop, are most easy to the rider.

5987. *In training saddle horses*, the first thing is to make them familiar with man, and other general objects, and which is best effected at the earliest period, which then saves almost all the trouble of breaking, and docility follows as a matter of course: to effect this, the greatest kindness should be used to the colts from the moment they are dropped: they should be accustomed to be handled, should be fed with bread, pasted in various parts of the body, have light matters put on their heads and backs, and subjects, of different colors and forms should be shown them with caution. While at foot, the mare and foal should be led out into roads, and where carriages pass, during which time, nothing should be allowed to intimidate the foal. By this management, the animal will be easily prepared for the future operations; and it is thus that the single foal the ploughed land farmer breeds, and which daily follows the mother in her work, as it were breaks itself.

5988. *Backing is the next operation*, and if the colt has been judiciously used, and taught familiarity and docility by early handling and kindness, it is by no means difficult. It should be commenced before the colt is two and a half or three years old. The first backing of a horse is a thing of great consequence, as his value afterwards very much depends on it. The application of the saddle should be gradually done, and without alarm to the horse. After a colt has become habituated to the saddle and bridle, and has been exercised some time, morning and evening in them, and become somewhat obedient, he is to be taken to some ploughed lands, the lighter the better; he must be made to trot over these in the hand sufficient to alightly tire him. This should be at first done in a cavesson, to insure obedience. Care being taken that all the tackling be good and firm, and every thing in its due and proper place; then a person is to hold his head and another to mount him; but this must by no means be done suddenly, or at a jerk, but very gradually and slowly, by several raisings and heavings. If he bear this patiently, the person is to seat himself firmly on his back; but if he be troublesome and not tame enough, the person is to forbear the attempt to mount, and he is to be trotted in the hand over the same ploughed lands again, till he is more fatigued and willing to receive the rider quietly on his back: when this is done, the person who is on his back must encourage him, and the man who has his head must lead him a few paces forward; all the while encouraging him. The feet are to be fitted well in the stirrups, and the toes turned out, afterwards the rider is to shrink and move himself in the saddle, and the person who holds his head is to withdraw his hand a little farther from the mouth. As the rider moves his toes forward, the holder must move him forward with the rein, till he is made to apprehend the rider's motion of body and foot, which must always go together, and with spirit, and will go forward without the other's assistance, and stay upon the restraint of the rider's hands. When this is accomplished, let him be cheered, and again have grass and bread to eat; and then let the rider mount and alight several times, encouraging him between each time, and thus he is to be managed till he will go on, or stand still at pleasure. This being done, the long rein may be laid aside, and the band about the neck, which are always used on this occasion, and nothing will be necessary but the trenches and cavesson, with the martingal. A groom must lead the way before; or another horse going only straight forwards, and making him stand still when desired. In this manner, by sometimes following, and sometimes going before another horse on the trot, the creature will by degrees be brought to know that it is his business to be quiet and governable.

5989. *To teach a horse the different movements of walking, trotting, galloping, and ambling*, comes next in order.

5990. *Walking is the slowest and least raised of all a horse's movements*. It is performed, as any one may observe, by the horse's lifting up its two legs on a side, the one after the other, beginning with the

hind leg first. Thus if he leads with the legs of the right side, then the first foot he lifts is the far hind foot, and in the time he is setting it down (which in a step is always short of the tread of his fore foot on the same side) he lifts his far fore foot, and sets it down before his near fore foot. Again, just as he is setting down his far fore foot, he lifts up his near hind foot, and sets it down again just short of his near fore foot; and just as he is setting it down, he lifts his near fore foot, and sets it down beyond his far fore foot. This is the true motion of a horse's legs in a walk; and this is the pace in which many things are best taught. For instance when the horse is to be taught to turn to the right and left, or from one hand to another, he is first to be taught it on the walk, then on the trot, and finally on the gallop. The walk is a pace to which team, carriage, and road horses should constantly be well broke, as being of great use in all such cases and intentions. It is an excellent pace too, in a saddle horse, when well performed by being properly taught.

5991. In trotting the limbs are diagonally employed; but their tenses or times, or rising and falling, are very different, as it is conducted slow or fast. In the slow trot the diagonal legs are elevated and replaced simultaneously; while those on the ground are preparing to elevate themselves, and the horse is for a moment on tiptoe; but until the original diagonal legs are set down, these are not wholly elevated: therefore the horse is during the moderate trot at no time without support. But it is very different when the trot is accelerated, as to nine or ten miles an hour; for then there is a period in every spring made by the diagonal members, when all the feet are in the air at the same time; and the body completely suspended from the ground by these means. Thus during this accelerated action, the off fore leg and near hind leg having been elevated in the air before they meet the ground, the near fore leg and the off hind one are not only prepared, as in the slow trot, to elevate themselves, but actually do so before the others are set down; consequently, the feet at this precise time, must be all in air. (fig. 631.) To speed in the trot, it is necessary that a horse pick up his feet quick, and extend them far forward. To the safety also, it is necessary he elevate his knee; at the same time the general elevation of the whole is operated by high withers, and oblique shoulders.



5992. Three qualities are essentially necessary to make the trot useful. It ought to be extended, supple, and even, or equal: these three qualities mutually depend upon each other, so that you cannot pass to the supple trot, without having first worked upon the extended trot; and you can never arrive at the even and equal trot, without having practised the supple. The extended trot is that in which the horse trots out without retaining himself, being quite straight and going directly forwards; and this consequently is the kind of trot with which you must begin. The supple trot is that in which the horse, at every motion he makes, bends and plays his joints by the elasticity of the organs composing them; as those of his shoulders, his knees, and feet, which no colts or raw horses can execute, who have not had their limbs supplied by exercise, and who always trot with a surprising stiffness and awkwardness, without the least spring or play in their joints. The even or equal trot is that in which the horse makes all his limbs and joints move so equally and exactly, that his legs never cover more ground one than the other, nor at one time more than another. To do this, the horse must necessarily unite and collect all his strength, and if the expression may be allowed, distribute it equally through all his joints. To go from the extended trot to the supple, you must gently and by degrees hold in your horse; and when by exercise he has attained sufficient ease and suppleness to manage his limbs readily, you must insensibly hold him in still more and more, and by degrees you will lead him to the equal trot.

5993. The manner of trotting a colt who has never been backed is as follows: put a plain snaffle in his mouth; sit a cavesson to his nose, to the ring of which tie a longe of a reasonable length. Let a groom hold this longe, who, having got at some distance from the colt, must stand still in the middle of the circle which the horse will make. Let another follow him with a long whip or chambrière in his hand. The colt being alarmed, will be forced to go forward, and to turn within the length of the cord, the groom must hold it tight in his hand; by this means he will draw in, or towards the centre, the head of the colt, and his croupe will of consequence be without the circle. In working a young horse after this manner do not press or hurry him. Let him walk first, and afterwards put him to the trot. If you neglect this method his legs will be embarrassed; he will lean on one side, and be more upon one haunch than the other; the inner fore foot will strike against the outer one, and the pain which this will occasion will drive him to seek some means of defence, and make him disobedient. If he refuses to trot, the person who holds the chambrière will animate him by trotting him, or striking the ground with it. If he offers to gallop instead of trotting, the groom must shake or jerk the cord that is tied to the cavesson, and he will fall into his trot. (Berenger's Art of Horsemanship, vol. i. ch. 4.) The value of this longing in a circle is incalculable, inasmuch as it supple the shoulders, and gives them a greater extent of action. It also increases the action of the whole limb downwards, and accustoms the horse to affect other movements, to be performed with an elevated hand.

5994. The gallop is the swiftest natural pace of a horse, performed by reaches or leaps; the two fore feet being raised almost at the same time; and when these are in the air, and just ready to touch the ground again, the two hind feet are lifted almost at once. In galloping, the horse may lead with which fore leg he pleases; the most usual way is that with the right, in which case the gallop is said to be *just*; but whichever it be, the hind leg of the same side must follow it next, which forms an even or equal gallop; otherwise the legs are said to be disunited, and the gallop to be false; to remedy which disorder, the rider must stay the horse a little on the hand, and help him on the spur on the contrary side to that on which he is disunited. However, this rule has not been always strictly observed; for hunting horses have been trained to lead indifferently with both legs, because it has been found, that a horse which has never been suffered to gallop but with his right fore leg, has been worn out on one side, when he has been fresh and sound on the other. In order to make a stop in a gallop straight forwards, the rider should carefully put his horse together, without altering or disturbing the appui, and throw his body back a little to accompany the action, and to relieve the horse's shoulders. In doing this he should seize the time of making the stop, keeping the hand and body quite still, exactly when he feels the horse put his fore feet to the ground, in order that by raising them immediately by the next motion which he makes, he may be upon

his haunches. When horses do not put out their strength sufficiently, they should be galloped briskly, and then slowly again by turns, and they will thus be compelled to obey the hand and heel. In the slow gallop, as well as in the trot, it is sometimes necessary to close the heels to the horse's sides, which is called *pinching*; but this should be done in such a manner as not to make the horse abandon himself upon the hand, and care must be taken that he be upon his haunches, and not upon his shoulders; and, therefore, when he is pinched, he should be kept in the hand. To put a horse well together, and make him bring his hinder legs under him, the rider must close his legs upon him, putting them very much back; this will oblige him to slide his legs under him; at the same instant let the hand be raised a little to support him before, and yielding again immediately. Let him be thus supported, and have the rein again from time to time, till he begins to play and bend his haunches, and gallops leaning and sitting down, as it were, upon them; let the rider then press him with the calves of his legs, and he will thus become quick and sensible to the touch. If a horse has too fine a mouth, gallop him upon sloping ground; this will oblige him to lean a little upon the hand, in order the better to put himself upon the haunches; and through fear of hurting his bars, he will be prevented from resisting the operation of the bit. If the horse is heavy in hand, gallop him up sloping ground; and when his appui is too strong, this will lighten him. The gallop serves to assure and make steady a weak and delicate mouth, and also to supple a horse, and make him steady and active in his limbs. (*Berenger's History and Art of Horsemanship*, vol. ii. p. 104, &c.)

5995. In galloping in a circle the horse is confined always to lead with his fore leg; within the turn; otherwise he is said to gallop false. But here, too, the hind leg of the same side must follow. The varieties of gallop are a *hand-gallop*, a *Canterbury-gallop*, a *school-gallop*, &c. A smooth gallop, close to the ground, the French call the English gallop, *galop à l'Anglois*.

5996. The canter is different from the gallop in some essential particulars. Whether the gallop be fast or slow, still the legs are at one period wholly removed from the ground, and the horse is all in air. In the canter, on the contrary, at no period is the horse completely elevated from the ground, but has always one or more points of contact with it. Blaine describes its operation thus: when performed on the right, the horse commences by first placing his off hind leg a little beyond the other; at nearly the same instant he elevates the fore hand, and places first the near fore leg on the ground; the off doubling over and beyond, is placed in an instant after it. In the next movement the hind legs are thrown in, and, while elevated, the off fore leg becomes raised from the ground; but the near fore leg is not elevated until the hinder ones are replaced. The near fore leg is, therefore, the whole point of support in cantering at each remove, and thus it is that cantering horses always first fail on that leg.

5997. The *amble* is a peculiar kind of pace, by which the horse changes sides at each remove; two legs of a side being always in the air, and two on the ground. An amble is usually the first natural pace of young colts, which, as soon as they have strength enough to trot, they quit. There is no such thing as an amble in the manege; the riding-masters allowing of no other paces beside walk, trot, and gallop; their reason is, that a horse may be put from a trot to a gallop, without stopping him; but not from an amble to a gallop without stopping. This movement, which is very laborious to the horse, and in which he ought not to be indulged, except on smooth ground, is very easy to the rider; it has not the hardness of a trot, because the hind leg moves along with the fore one, and creates no resistance to the motion. It is, however, now never taught, and therefore any directions regarding it would be useless.

5998. The training of cavalry horses is exclusively performed in the military establishments, and therefore can never be required of the farmer or breeder.

5999. The training of coach horses commences with taming, walking, trotting, and repeated longing; and next with yoking and driving in a break or four-wheeled frame, with no other load than that of the coach box or seat placed in the usual position, the driver and his assistant sitting on a board fixed to the perch or hind axle, in order to be ready at a moment's notice, to descend and restrain, or direct the horses. Coach horses, from 15 to 16 hands high, should walk light five miles an hour, and trot twelve. They should be first accustomed to this exercise in the country, next in the outskirts of a large city, and lastly in the most crowded streets.

6000. The age at which a horse is fit to be worked in a coach, is four and a half or five years; but by the fraudulent practice both of the country and town dealers, horses of three and four years old are frequently employed. The first business of the Yorkshire dealer, who has three or four year old colts to dispose of, is to draw their corner teeth, in order to make them have the mouths of those of five. They also undergo the operation of docking and nicking; and after having been kept two or three months on mashes, made of bran, ground oats, or boiled corn, they are sold to the London dealers, who, it is said, sell these three or four years old horses as if they were five years old. They are then taken into immediate work, either for the coach or saddle; and in a few months are completely destroyed by this premature and too severe labor. The drawing of the teeth is not a fraud practised on the London dealers; they know the deception, and insist upon its being done by the country dealers. It is requisite to be done some months before the London dealers finally sell them for use, or the tooth which denotes a horse to be five years old would not be grown, consequently the deception could not have taken place.

6001. The training of cart and plough horses commences with taming before they are a year old, with walking and rubbing them down in the stable when they are two, and with training to work when they are of three years growth. They should be placed under the charge of a very steady careful servant, who will teach them to back, and to go into the shafts. They ought not, however, to be made to draw any other than a very light empty cart, till their fourth or fifth year; nor ought they to be put into the shafts of a threshing machine before their fifth year. The first work to which an agricultural horse may be applied, is harrowing; but this during the fourth year only half a day at a time, or with a light harrow the whole day. Next he may be put to plough with similar care and caution in regard to strength. In general, agricultural horses require very little training; but one thing is too often neglected, and that is, teaching plough horses a quick step, and keeping them at that step ever after in working them. By not attending

to this, and leaving the step to be regulated by lazy, spiritless ploughmen, the loss to many farmers is very considerable.

SECT. XIII. *Of the Art of Horsemanship.*

6002. *Horsemanship, as an art*, is unquestionably of very ancient date, and it is curious how very different are the modes by which it is practised in different countries; but which differences are yet principally confined to the situation of the legs of the rider: for wherever the horse is used to carry the person, it is by the rider placing himself astride the animal. Horses were used in this way for centuries before any apparatus was used or applied to their bodies to spare fatigue to the rider; and we know that the first saddles were mere pads strapped round the body, but without the appendages of stirrups. In England, riding is systematically divided in two kinds, which are manege and jockey riding.

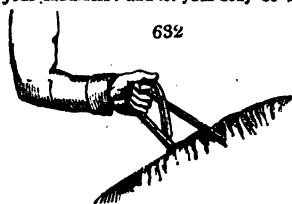
6003. *Manege riding*, called also *riding the great horse*, in the strict application of the term, was formerly more practised than at present; and required a system of education for both horse and rider long and severe. Horses perfectly broke for the manege, were taught several paces and motions, as ambling, pacing, passing, jerking, capriole, and cornetti. The practice of these artificial cadences, it is supposed, injures the natural pace of the horse; and this circumstance, united to a particular form of horse (defective for other purposes) being required for the elasticity of these actions, has tended to bring manege riding, as formerly practised, into disrepute. Manege riding also taught the constant application of the seat of the body of the rider, to the seat of the saddle, during all the motions of the horse; and as a severe education, and a particular form, had bestowed ease and elasticity to the rudeness of the manege horse, the inconveniences of this seat were not felt. But when another form of horse, capable of great speed over excellent roads, was in general use, this kind of riding was found hurtful to both horse and rider; fatiguing the one, and injuring the other.

6004. *The art of proper riding*, as practised among experienced horsemen, is derived from a knowledge of the judicious application of the aids of the bridle, as taught in our schools, and as practised in the army generally: and also from a proper application or placing the body on the horse. These we certainly owe to manege riding; and a knowledge of them is as essential to the safety of the rider, as it is to the grace of his appearance as a horseman. The proper art of riding embraces all that is taught in the best schools, or practised on the road; and is equally applicable to both. This is allowed to its fullest extent by those who have possessed themselves of the requisite information, and practise on the subject; but is denied by those who, wedded to field riding, contend that the perfection of horsemanship consists in a snaffle bridle and a jockey seat.

6005. *The use of the curb bridle* is considered in the schools to be essential to good riding: by it the horse is not only restrained, but he is also aided and assisted. He is alternately thrown on his haunches, or forced on his forehead, by which changes fatigue is prevented to both. Great nicety, however, is required in the use of the curb; and without an inclination and ability to use it lightly and dexterously, a snaffle is the best and safest bridle. The curb is to be operated by a gentle turn of the wrist only; and the action of the hand in this respect should be as fine, and as pliable as the fishing rod and line. The force of the curb should in every instance be portioned to the mouth of the horse.

6006. *The best form of saddle for general riding* is one in which the cantle is not so high as the military, nor so low as the racing saddle. The pommel should be no more raised than is necessary to keep the whole completely free from the withers. The stirrups should be substantial, not only to prevent breaking; but also that by their weight they may fall to the foot when accidentally slipped away; which is of more consequence than at first sight may appear. If they are of the spring kind, it is also desirable: but it is still more so, that the spring stirrup leather should be used; which prevents the danger arising from horses catching the leather in the projections of doors, gates, &c. Having saddled and bridled our horse we will proceed to mount our rider.

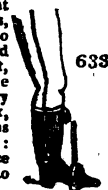
6007. *If you would mount with ease and safety*, says Hughes, stand rather before the stirrup than behind it; then, with the left hand, take the bridle short, and the mane together, help yourself into the stirrup, with your right, so that, in mounting, your toe do not touch the horse. Your foot being in the stirrup, raise yourself till you face the side of the horse, and look directly across the saddle; then, with your right hand, lay hold of the hinder part of the saddle, and, with your left, lift yourself into it. When mounted, let your position on the saddle be square, and the purchase of your bridle such as not to pull your shoulders: and let your body be in such an even posture as if you held a rein in each hand. In



holding the bridle, grasp the reins with your hand, which should be held perpendicular with the reins passed, the lower within the hand, and the upper, between the fore and next fingers. (Fig. 632.) The reins are then brought over the fore finger and firmly held by the thumb. It is often directed to place the little finger between the lower reins; the practice of this may be optional with the rider, and in a very fine hand is desirable. The bridle should be held at such a length as to enable you if your horse stumbles, to raise his head and support it with your arms; and by throwing your body backwards at the same time you frequently save a horse that would otherwise fall.

6008. *A graceful and proper seat on horseback* is greatly dependent on a right disposition of the legs and thighs, which should hang nearly straight down, easily, and without force or constraint: all which is brought about from above; by placing the body flat and evenly on the saddle, and opening the knees, whereby the fork will come lower on the saddle. (Fig. 633.) The thighs should be applied to the saddle and to the sides of the horse by their inner surfaces, so as to bring in the knees and toes; and although the line may be properly broken by some little irregularities, yet the foot, the knee, the hip, and shoulder, should deviate but little from one perpendicular line. The ball of the foot should rest within the stirrup, and should be even with the heel, or very slightly elevated above it. Avoid any stiffness in the legs, thighs, or body; all should be lax, but in a state to be able to embrace the horse, either for support, or as aids to him. The loins particularly, should be lax and pliable, as a coachman's on his box; and for the same reasons: for by sitting thus loosely, the rough motions of both are broken. To depend on the embrace of the knees for support, is to lose the benefit of a true equipoise of body, and is rather to stick on a horse than to sit on one.

6009. *When you are troubled with a horse that is vicious*, which stops short, or, by rising or kicking, endeavors to throw you off, you must not bend your body forward, as is commonly practised in such cases; because that motion throws the breech backward, and moves you from your fork, or twists and casts you out of your seat: but the right way to keep your seat, or to recover it when lost, is, to advance the lower part of your body, and to bend back your shoulders and upper part. In flying or standing leaps, a horseman's best security is the bending back of the body. The rising of the horse does not affect the rider's



seat; he is chiefly to guard against the lash of the animal's hind legs, which is best done by inclining the body backward. But the usual method of fixing the knees in all cases of danger only serves, in great shocks, to assist the violence of the fall. To save yourself from being hurt, in these cases, you must yield a little to the horse's motion; by which means you will recover your seat, if displaced, or keep it at such times as would dismount an unskilful horseman.

6010. *If your horse grows unruly*, take the reins separately, one in each hand, put your arms forward, and hold him short, but do not pull hard with your arms low; for, by lowering his head, he has the more liberty to throw out his heels: but if you raise his head as high as you can, this will prevent him from rising before or behind; nor, while his head is in this position, can he make either of these motions. Is it not reasonable to imagine, that, if a horse is forced towards a carriage which he has started at, he will think he is obliged to attack or run against it? Can it be imagined that the rider's spurring him on, with his face directly to it, he should understand as a sign to pass it? These rational queries are submitted to the serious consideration of such as are fond of always obliging their horses to touch those objects at which they are, or affect to be, frightened.

6011. *Indifferent horsemen*, Lawrence observes, should never venture on horseback without spurs. Those who reflect upon the predicament of being placed between a deep ditch and a carriage, at which their horse shies, will see the necessity of this precaution.

6012. *Previous to mounting*, every person will find his account in examining the state of both horse and furniture with his own eyes and hands; for, however good and careful his groom may generally be, it is a maxim, that too much ought not to be expected from the head of him who labors with his hands. Besides, all such sedulously avoid trouble, particularly in nice matters. For example, see that your curb is right, that your reins are not twisted, that your girths, one over the other, still bear exactly alike; that the pad be not wrinkled up; but, above all, that your saddle lies exactly level upon the horse's back.

6013. *On getting off the horse's back*, hold the bridle and mane in the same manner as when you mounted, hold the pommel of the saddle with your right-hand; to raise yourself, bring your right leg over the horse's back, let your right-hand hold the hind part of the saddle, and stand a moment on your stirrup, just as when you mounted. But beware that, in dismounting, you bend not your right knee, lest the horse should be touched by the spur.

6014. *The jockey mode of riding* is practised in its fullest extent in racing. With some modification it is also in use by many who esteem themselves excellent fox-hunters. With still greater modification it is by its advocates practised also on the road. English post-boys unite these two kinds of riding in a manner at once easy to themselves and horses. True jockey riding consists in the use of a snaffle bridle, which is held firmly; and, as an advocate for it expresses himself, to enable the rider to give his horse the proper pulls. To this end, the same writer recommends a firm seat, upright, and as you would sit in a chair, with the knees nearly as much bent, and turned inward; the toes somewhat out and upward; the leg falling nearly straight, and the foot home in the stirrup (*fig. 634.*); elbows close to the sides; hands rather above the horse's withers, or pommel of the saddle; and the view directed between his ears. The same writer further advocates the jockey mode, by commenting on the decline of riding-house forms, and the universal preference given to expedition, which, as he says, fully confirm the superior use and propriety of a jockey-seat. Indeed, our riding-schools are now, he continues, considerably reformed from the stiffness of ancient practice in all respects. It was the practice formerly in the schools, and indeed pretty generally upon the road, to ride with the tip of the toe only in the stirrup; as if it were of more consequence to prepare for falling with safety, than to endeavor to sit securely. Those who preserve a partiality for this venerable custom, we would advise to suspend a final judgment, until they have made a few more essays upon a huge cock-tail half-bred, of that kind which 'cannot go, and yet won't stand still,' and will start from one side of the road to the other, as if he really desired to get rid of his burden. Nor is the ball of the foot a proper rest; chiefly because inconvenient to that erect, or rather almost kneeling, posture, which is required in speedy riding. The riding-house seat is preserved by the balance or equipose of the body solely; that recommended here by the firm hold of the knee, which is obviously strengthened by the opposite directions of the knee and toe, the one in, the other outward.

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SECT. XIV. Of the Feeding of Horses.

6015. *The feeding of horses generally*, is an important feature in their management. In considering the food for horses, we are apt to locate our notions to the matters around us, without taking into account that every country has its peculiar products. White observes that the best food for horses is hay and oats; and had he added for English horses, it might have been just, but without such notice the assertion is much too confined. In some sterile countries, horses are forced to subsist on dried fish, and even vegetable mould; in Arabia on milk, flesh balls, eggs, broth, &c. In India, where the native grasses are tall, but little nutritious, the better sorts are fed on Indian corn, rice, millet, &c.; and the poorer on rushes, sedge, leaves, &c. In the West Indies on maize, Guinea corn, and sugar-cane tops; and in some instances on the sugar itself, in the form of molasses. In France, Spain, and Italy, besides the grasses, the leaves of limes, vines, the tops of acacia, the seeds of the carob tree, &c. are used.

6016. *The food of British horses* may be divided into herbage, grain, roots, and mixtures. Of herbage, the principal kind is the proper graminæ, eaten either moist, or dried into hay. When eaten moist in their natural state, such a horse is said to *graze*; but when these matters are cut and carried into the stable to a horse, he is said to be *sold*. Hay is herbage cut during its flowering and seeding processes, which being subjected to the action of the sun and air a proper time, are then collected into large masses called ricks, where a certain degree of fermentation takes place before the matter is fitted to become wholesome or nutritious, or before it receives such alteration as fits it for resisting further decomposition and decay. The judicious management of this fermentative process forms one of the greatest desiderata in hay making. Pursued to a proper extent, the remaining moisture acting on the farinaceous parts, as the seeds, &c., in conjunction with the heat evolved during the process, as it were masts the whole, and sugar is produced. Pushed beyond this, the hay becomes carbonised, and mow burnt; its nutritive properties are lessened, and its noxious qualities increased, it being found in this state to excite diabetes, sweating, and extreme weakness and emaciation. (5756.) The quality of the hay is too little attended to, but which is of very great importance; and more particularly so where little corn but much hay is given. Hay should therefore be of the best, whether meadow, clover, or mixed. Many horses thrive best on clover hay, particularly draught horses. It is very grateful to horses, and it saves much waste of saliva; to sprinkle hay with water, has the same effect, but it should only be done as it is wanted.

6017. *Hay should never be given in large quantities at a time*, horses breathe on it, become disgusted, and then waste it. They also, when it is good, eat too much, and distend their stomachs, and then

become crib-biters. Hay should not be kept in the stable in great quantities, otherwise it becomes impregnated with the volatile alkali of the stable, and is then spoiled. As substitutes for hay, the straw of wheat, barley, oats, and rye are used; but these are much less nutritive, and rather serve to excite mastication by mixing them with other matters, than to be depended on for animalization. On hay, when good, many horses subsist; and when no exertions are required of them they are sufficiently nourished by it.

6018. *The grain used as horse food* is of various kinds, possessing, it is supposed, different degrees of nutriment, according to their different proportions of gluten, sugar, or farinaceous matter. In South Britain, oats are almost exclusively used as horse grain; and which, according to the experiments of Sir Humphrey Davy, as we have seen (4598.), contain 748 parts of nutritious matter out of 1000. In wheat, 955 parts of 1000 are nutritious; but wheat is seldom given with us except to racers and hunters, or on extraordinary occasions when great excitement is required, when it is sometimes given in the form of bread. Barley is more frequently given than wheat, and contains 920 parts in 1000 of nutritious particles. Made into malt, where its sugar is evolved, it becomes still more highly nutritious. Barley appears to have been the principal horse food of the ancients.

6019. *The pulse used as horse food*, are the seeds of beans, peas, vetches, &c. Beans are seldom given alone on account of their heating and astringent qualities, but are mixed with straw or hay, cut into chaff, either whole or broken.

6020. *The roots used as horse food*, are such as contain much sugar, but in which the gluten is in small proportion only. Carrots stand deservedly high, on this list. They are favorable to condition, as the skin and hair always look well under their use. They are highly nutritious we know, from the fattening that occurs from them. They also generate good flesh, as we know horses can work on them, and have their wind increased by their use; indeed, so favorable are they to the proper action of the lungs, that a course of carrots will frequently remove the most obstinate coughs. The parsnep has similar properties. Swedish turnips, as having the saccharine particles in abundance, are also found good. Beet-root likewise.

6021. *Mixtures, or mixed food*, is formed of several kinds among agriculturists; and it possesses many advantages, as it can be varied to every taste, and made either cooling as an alternative, or nutritious and stimulating as a tonic. Although it is principally used for waggon, post, and farm horses, it would be better were its use more universal. Of this manger feeding, one of the best is formed from a chaff made of one part best meadow or clover hay, and two parts wheaten straw; to three bushels of this mixture add one of bruised oats. The importance of bruising or flattening the oats is very great. When used whole, the grains are apt to slip between the teeth or the chaff in mastication. In fact, corn when either given alone, or with chaff, would, in most instances, benefit by bruising. To horses under great exertion, the stomach must be, to a certain degree, weakened also; in such cases, by bruising their corn, not only the work of mastication is much of it spared, but that of the stomach also. In old horses with worn teeth, bruised oats are of great consequence. Fast eating horses do not properly masticate more than one half of their corn; much of it remains in the dung so perfectly unaltered, that it will afterwards vegetate; and the celebrated agriculturist Curwen states, that during his residence in India, in a season of scarcity, half famished wretches actually followed the cavalry, and drew their principal subsistence from the unchewed grains of corn extracted from the excrement of the horses. Of this manger food, three, four, five, or six pecks may be given daily, according to size and exertions required; and as but little hay is required, so hard worked horses are enabled to lie down much more, instead of standing on their already fatigued limbs to eat hay.

6022. *Cooked food* is also now much used by practical agriculturists for horses. The articles made use of are potatoes, carrots, turnips or parsneps. To horses with their digestion weakened by hard work, old age, or other causes, food in sufficient quantities, thus already reduced to a pulaceous mass, resembling chyme, without the loss of time, or the waste of saliva, may be very important: for as Curwen very judiciously observes, a horse will consume nearly six hours in eating a stone of hay, whereas he will eat a stone of steamed potatoes in twenty minutes. Horses are observed of themselves to lie down after eating cooked food sooner than other times.

6023. *The quantity of food* to be given to a horse must be regulated by circumstances, the principle of which is the exertions or nature of the work required of him. If this be simply laborious, as drawing of loads, or carrying of weights, all that is requisite is that the food be sufficiently nutritious. The bulk from whence such nutriment is gained is not a matter of import: but if such exertions are to be combined with celerity, as in our racers, hunters, &c.; it is evident that such feeding is best adapted to the end required which combines nutriment without bulk; and which increases the durability by increasing the mental irritability, and thus giving tone and courage. These are found to be better derived from a proportionate allowance of grain or corn, than any other mode of feeding at present known. It remains only to add, that although experience has fully proved this, in all cases where the exertions are extreme; yet it has also led to another evil, by introducing a plan of treating all horses of value alike. Thus most of the more valuable hacknies, the carriage horses of the wealthy, &c., are accustomed to be fed, not as though their exertions were moderate; but as though they were unceasing, to the great injury of themselves, and to the destruction of a vast quantity of valuable corn. To thousands of such horses, at least one third of their hay and corn might be advantageously abstracted.

6024. *Too great a quantity of food* injures not only the community but the horse also. The stomach becomes distended by over-feeding, and it then becomes weak and incapable of a healthy digestion; crib-biting, hide-bound, and perverseness follow; or when the stomach does digest this undue quantity, it generates fulness, which shews itself in inflammations or foulness, appearing in the form of cracks and grease.

6025. *A horse in full work*, of whatever kind, will require, according to his size, a peck of sound oats in twenty-four hours; and when the work is unremitting, as in post horses, even more may be required. Some post horses have an unlimited quantity given them; but this practice is always erroneous. If they eat more, it serves only to distend the stomach unduly, and also to require stronger digestive powers: if they blow on it they leave it, and it is wasted, or a more greedy one swallows it up without mastication; and both stomach, horse, and master, are thereby robbed. The oats should be of the very best, with a thin skin, and should weigh from thirty-eight to forty pounds the bushel. They should also be sweet and free from must, and not kiln-dried. When put into a wide manger and spread about, being first sprinkled with water, their benefit is increased. No horse will require more than eight or ten pounds of hay, in twenty-four hours: from six to eight pounds are usually sufficient. When it can be conveniently done, the quantity of both hay and corn should be divided into four portions. The largest portion both of hay

and corn should be given at night; the next in quantity in the morning; the other two portions at noon, and about four in the afternoon. This however must depend on the work of the horse, and other circumstances.

6026. *Watering of horses* is an important part of their management, and many errors are committed relative to it. It is equally erroneous to debar them from it, as it is to allow them too much; and the former is much the most common evil. In summer, or when from great perspiration, the animal juices are wasted, it generates fevers, and wastes the strength and spirits. All horses prefer soft water, and as nature is unerring, there is no doubt but that it is the most wholesome. As some horses drink quicker than others, it is not a good custom to take riding horses to a pond, unless at night, when the quantity cannot harm them; or when not intended for early work the next morning, as hunting, &c.

6027. *The necessary quantity of water* for a horse should be regulated by circumstances, as the weather, the work, &c. In common cases, a large horse requires rather more than the half of a large stable pail full twice in the day. At night a full pail should be allowed. Horses should never be galloped after drinking; it has destroyed thousands, by gripes, inflammations, and broken wind. This custom also uses horses to expect they are to run away directly they are accidentally watered at any time. Others, expecting they are to be fatigued with a gallop, will avoid drinking at all. The most that should ever be done, is to suffer no horse to drink his fill at a river or pond; but having giving him half what is necessary, walk him ten minutes, and then give him all that is required, and walk him again.

SECT. XV. *Of the Stabling and Grooming of Horses.*

6028. *The stabling of horses* is likewise a most important point in their management, the more so as being wholly a deviation from nature; hence, under the most judicious management it is liable to produce some departure from health, and as some times managed, is most hurtful to it. Clothing, dressing or combing, and exercise, are also highly important.

6029. *Every stable should be large, cool, and airy.* It is too common to suppose that warmth is so congenial to horses, that they cannot be kept too hot; but there is reason to suppose that many of the diseases of horses are attributable to the enervating effects of unnatural heat, and of an air breathed and rebreathed over again. Blaine says, Is it not alike repugnant to reason and experience, to expect to keep animals in health, that from stables heated to sixty degrees, and further protected by warm clothing, are first stripped, and then at once exposed to a temperature at the freezing point? If it be argued that habit and exercise render these less hurtful, it will be easy to answer that their original hardihood is lost by confinement and artificial treatment; and that neither does exercise always tend to obviate the effects of this sudden change: for our best carriage horses, and hackneys also, have often to wait hours in roads and streets the convenience of their owners, or the pleasure of the groom.

6030. *The heat of a stable* should be regulated by a thermometer, and the heat shown by it should never exceed 50° of Fahrenheit in winter, or 62° or 63° in summer. To renew the air, the stable should be well ventilated; and which is best done by trunks or tubes passing from the ceiling through the roof.

6031. *A stable should not only be well ventilated, but it should be light also;* and the windows should be so constructed as to admit light and air, without making a current of wind on the bodies of the horses. Darkened stables are very hurtful to the eyes; neither do they, as was formerly supposed at Newmarket, tend to the condition or rest of a horse.

6032. *A stable should have a close ceiling* to keep the dust and dirt from the hay-loft from entering the horses' eyes. It also necessary to prevent the ammoniacal gases from ascending and lodging in the hay. It is preferable that the hay-loft be altogether removed from over the stable; and if a very high ceiling even to the roof were substituted, it would be for the benefit of the horses.

6033. *The form of the rack and manger* should be attended to. Sloping racks are disadvantageous, as encouraging dust in the eyes. They should therefore be upright, and by no means so high as they usually are, by which the head and neck are put injuriously on the stretch. As a proof that this is unpleasant to horses, many of them first pull out all the hay, and then leisurely eat it. The manger should be wide at the bottom, and of a proper height: care should be taken that no splinters are present to endanger the lips, nose, and mouth. The halter reins should, in good stables, be suffered to run within a groove within the manger post, to prevent the rein entangling the legs.

6034. *The stalls of a stable should be wide.* Strains in the back, and sometimes even worse evils, are the consequence of the standings being too narrow. Bails are objectionable from the ease with which horses can kick over them; and also from the quickest feeder getting most food, when several horses stand together bailed.

6035. *The acidity of the stalls* is a matter of much dispute: when too much raised, as in dealers' stables, they put the back sinews on the stretch, and fatigue horses much. It is more natural that they should be even; or that a very slight slope only be allowed to carry off the urine. The best mode, however, of carrying off the urine, is by means of a small grating to each stall, communicating with a cess pool without doors, which should be closed up, that a current of air may not come through the grating. Such a contrivance will effectually carry off the water, and prevent the volatile alkali of the urine from impregnating the air around. For the same reasons the dung should be removed, if possible, wholly without the stable as soon as dropped; for the exhalations from that are also ammoniacal, and consequently hurtful. To this cause alone, we may attribute many diseases; particularly the great tendency stabled horses have to become affected in the eyes. The pungency of this effluvia is familiar to every one on entering a close stable in the morning, and when the long-soiled litter is removed, it is absolutely unbearable.

6036. *The litter of horses* should be kept dry and sweet, and should be often removed. When it is suffered to remain, under the notion of making better dung, the horse may be ruined; neither does the manure benefit as is supposed; for when it is removed to the dung pit, the close confinement does it more good than the open exposure in the stable, when it parts with its salts, on which its properties as manure partly depend.

6037. *Horses should not stand on litter* during the day, although very generally suffered to do so. Litter is thought to save the shoes and even the feet, by preventing the uneven surface of the stable from hurting them: but it holds the urine; it tenders the feet; it heats them also; and is very apt to encourage swelling at the heels: as we know by removing it, when they immediately go down. A little litter may be strewed behind to obviate the effect of kicking, or the splashing of urine in mares.

6038. *The clothing of horses* is apt to be carried to as erroneous an extent, as the heat of their stables. When horses go out in cold weather, and are intended to have merely a long walking exercise, then clothing is very proper: but it must be evident, that when taken clothed from a stable and exercised briskly so as to produce perspiration, it is erroneous; for not only are the clothes wetted and thus liable to give cold, but the horse is unfitted to go out afterwards with a saddle only. Saddle horses kept in condition stand clothed in a kersey sheet, and girted with a broad roller, with occasionally the addition of a quarter-piece; the breast-plate is sometimes put on when going out to exercise; the hood is used to race-horses only, except in case of sickness. All horses, excepting racers, are best without clothing in the summer season.

6039. *The grooming or dressing of horses* is generally thus practised: having tied

up the horse's head, take a curry-comb, and curry him all over his body, to raise the dandruff or scurf, beginning first at his neck, holding the left cheek of the head-stall in your left hand, and curry him from the setting on of his head, all along his neck, to his shoulder, and so go all over his body to the buttocks, down to his hocks; then change your hands, and curry him before on his breast, and laying your right arm over his back, join your right side to his left, and curry him all under his belly to his chest, and so all over very well, from the knees and shoulders upwards: after that, go to the far side, and do in like manner. Then take a dead horse's tail, or a dusting-cloth of cotton, and strike that dust away which the curry-comb has raised. Then take a round brush, made of bristles, and dress him all over, both head, body, and legs, to the very fetlocks, always cleansing the brush from that dust which it gathers, by rubbing it upon the curry-comb. After that, take a hair-cloth, and rub him again all over very hard, both to take away the loose hairs, and to help to lay his coat; then wash your hands in fair water, and rub him all over with wet hands, as well head as body; for that will cleanse away all those hairs and dust the hair-cloth left. Lastly, take a clean cloth, and rub him all over till he be very dry, for that will make his coat smooth and clean. Then take another hair-cloth (for you should have two, one for his body and another for his legs), and rub all his legs exceedingly well, from the knees and hocks downwards to his very hoof, picking and dressing them very carefully about the fetlocks from gravel and dust, which will lie in the bending of his joints.

6040. *The curry-comb should not be too sharp, or, at least, not used in a rude and severe manner, so as to be an object of torture and dread, instead of delight and gratification to the horse. It is too often the fate of thin-skinned horses to suffer much from the brutality of heavy-handed and ignorant fellows, who do not recollect that the unhappy animal is suffering, every time he writhes and attempts to escape from the comb or brush, the same tortures that they themselves experience when tickled on the soles of their feet.*

6041. *The care of the legs and feet forms a most important branch of stable discipline. The legs must be kept perfectly dry, and so clean that not a speck of dirt be suffered to lodge in any crevice under the knee or fetlock, or around the coronet, and withal preserved cool and free from stiffness and inflammation. Dirt suffered to form a lodgment, or wet remaining upon the legs in cold weather, will fret the skin, and cause cracked heels, malleanders and sellenders, rat's-tails, crown-scab, and such a train of stable plagues, as may baffle the most vigorous efforts during a whole winter. From want of care, the best shag-legged horses, whatever may be their condition, will soon become greased. Much care should likewise be taken not to irritate and add to the inflammation of the legs, by harsh rubbing; and if they be moderately bandaged with linen or woollen, which every groom knows how to perform neatly, it will contribute to cleanliness and the general end. Some gallopers are apt to crack the skin of their heels in exercise: in that case, supple the skin occasionally with simple ointment, though, in general, warm-water will be a sufficient preservative. Pains and soreness in the shins and shank-bones are often the consequence of exercise over hard ground in very dry seasons, for which there is no better palliative than frequent warm emollient fomentations. It forms a part of the constant attention of a good horse-keeper, to see that the feet of his horses be well-cleansed beneath the shoe with the picker from all small stones or gravel, at every return from abroad. The shoes must be examined, that their ends do not press into the crust, and that the nails be fast, and that the clinches do not rise to cut the horse. In these cases, instant application must be made to the farrier: horses ought by no means to remain in old shoes until the toe is worn away, or the webs become so thin that there is danger of their breaking, unless in case of brittle hoofs, when it is an object to shoe as seldom as possible. Upon the average, good shoes will wear near a month. Steeling the toes is, in general, an useful practice, but less necessary when the best iron is made use of. Where any tendency to dry hoof exists, the feet should be stopped with equal parts of clay, cow dung, and chamberlye every night, otherwise, twice or three times a week will be sufficient. A still better stopping is made by adding a little tar to the other matters. It is also prudent, when the hoofs have any tendency to hardness and contraction, to water the front part of the stall a little; and also occasionally, or constantly, to hang around the hoofs an apparatus, made by doubling a circle of woollen cloth over a tape, which should be tied around the fetlocks loosely: the two segments of the cloth will then fold around the hoof, and correspond to it in shape. This may be dipped in water, and will be found very convenient in keeping the feet moist and cool. Very brittle hoofs are greatly benefited by brushing them over with a mixture of whale oil and tar. It is considered as beneficial, in general, to take off the shoes of a horse who is necessitated to stand long in the stable, and who does no work, and to substitute tips; the growth of the crust, and the enlargement of the heels being thereby promoted.*

6042. *The care of the furniture and trappings is another part of the duty of a horse-keeper. These are best kept in order by being instantly rubbed clean after use, and placed in a dry situation; by which method, neither oil nor scouring-paper is often found necessary. Great care should be taken to dry the pads of the saddles after journey, and never to put a hardened and damp saddle upon the horse's back. The same is also necessary with regard to the body-clothes. The pads of the saddles ought to be kept perfectly soft, and free of dirt and sweat; and, after use, should be dried either in the sun or by the fire, and hung in a dry place: the clothes also should be washed much oftener than they generally are, and ever kept perfectly dry, and in a sweet state.*

6043. *The exercising of horses is essentially necessary for their health, as it counteracts the effects of the artificial life we force on them. High feeding, heated stables, and unnatural clothing are, particularly the first, counteracted by proper exercise; and without it, horses become pursive, fat, heavy, and greased; for, when the secretions do not find themselves natural vents by perspiration, &c., they will find themselves artificial ones. Exercise keeps down the fat, and it also hardens and condenses the muscles by drawing their fibres nearer together; it likewise enlarges the muscles. Thus the appearance, as well as the feel, when we handle the flesh of a horse in condition by proper exercise, is totally different from those of one merely full of flesh by fat, &c. Exercise increases the wind by taking up the useless fat, and by accustoming the lungs to expand themselves.*

6044. *The quantity of exercise necessary for a horse must be regulated by a variety of circumstances; as age, constitution, condition, and his ordinary work. A young horse requires more exercise than an old one, but it should be neither very long, nor very fatiguing. Some colts are observed to come out of the breaker's hands with splints and spavins, owing to the severe exercise they have undergone. When*

horses are in general work, a little walking exercise in the morning in body cloths, if the condition be very high, or the weather be very cold, is all that is necessary; but, on days when their common work is not expected to occur, a full fed horse should be exercised twice a day, an hour at each time; or, if only once a day, then an hour and a half or two hours' exercise should be given; two-thirds of which ought to be passed in walking; the other should be passed in a moderate trot in the hackney, and divided into galloping and trotting in the hunter. The racer has his regular gallops at stated periods; but the exercise of each should always finish with a walk of sufficient length, to bring the horse in cool, both in person and temper.

SECT. XVI. *Of the Management and Working of Horses.*

6045. *The working of horses* includes the racing, hunting, and journeying of saddle horses; and the treatment in harness of coach, waggon, cart, and farm horses.

SUBSECT. 1. *Management and Working of Race Horses.*

6046. *In the managing and working of race horses*, three things are to be considered, the preparation of the horse, the conduct of the rider, and the after treatment of the horse. The preparation of a race horse for running a race is not the work of a few days, if there be any great dependence on the success. A month at least is required to harden his muscles in training, by proper food and exercise, and to refine his wind, by clearing his body to that degree of perfection that is attainable by art. It is first necessary to ascertain correctly the present state of the horse, as whether he be low or high in flesh; and in either case, a proper estimate should be formed of the time and means required to bring him into true running condition.

6047. *If a race horse be low in flesh*, it is necessary to judge of the cause of such state, and to act accordingly, the necessary proceedings for which were detailed in treating of condition. (5756.) It is to be remarked, that spices are less to be depended on for this purpose than generous food, as malt mashes; and if any thing of the kind be used, let it be the simple cordial ball. (*Vet. Pharm.* 5899.) Feed frequently, and by little at a time: while he is thus low, let his exercise be walking only, and by no means spare his water, or he will become hide-bound: carefully watch him, that full feeding may not disagree by making his heels swell, or his coat unthrifty; and if such appearances occur, mash him, and begin his scourgings, otherwise abstain from physicking until he is in better health. As he improves in condition, increase his exercise, but not to such a degree as to make him sweat: his food must now be the best oats and beans, with wheaten or barley bread; the beans and oats are to be put into a bag, and beaten till the hulls are all off, and then winnowed clean; and the bread, instead of being chipped in the common way, is to have the crust clean off.

6048. *If the horse be in good flesh and spirits* when taken up for his month's preparation, cordials are altogether unnecessary; and the chief business will be to give him good food, and so much exercise as will keep him in wind, without over-sweating, or tiring his spirits. When he takes larger exercise afterwards, towards the end of the month, it will be proper to have some horses in the place to run against him. This will put him upon his mettle, and the beating them will give him spirits. This, however, is to be cautiously observed, that he has not a bloody heat given him for ten days or a fortnight before the plate is to be run for; and that the last heat that is given him the day before the race, must be in his clothes: this will make him run with greatly more vigor when stripped for the race, and feeling the cold wind on every part. In the second week, the horse should have the same food and more exercise: and in the last fortnight he must have dried oats, that have been hulled by beating; after this jockies wet them with the whites of eggs, beaten up, and then laid out in the sun to dry; and when as dry as before, the horse is to have them: this sort of food being considered by them as very light of digestion, and very good for the creature's wind. The beans in this time should be given more sparingly, and the bread should be made of three parts wheat and one part beans, or of wheat and barley in equal parts. If he should become costive under this course, he must then have bran-water to drink, or some ale and whites of eggs beaten together; and keep his body moist. In the last week all mashing is to be omitted, and barley-water given him in its place; and every day, till the day before the race, he should have his fill of hay; then he must have it given him more sparingly, that he may have time to digest it; and in the morning of the race-day, he must have a toast or two of white bread soaked in ale, and the same just before he is led out of the field. This is an excellent method, because the two extremes of fullness and fasting are at this time to be equally avoided; the one heating his wind, and the other occasioning a faintness that may make him lose. After he has had his food, the litter is to be shook up, and the stable kept quiet, that he may be disturbed by nothing till he is taken out to run.

6049. *In the choice of a rider for winning a race*, it is necessary, as far as possible, to select one that is not only expert and able, but honest. He must have a very close seat, his knees being turned close to the saddle skirts, and held firmly there; and the toes turned inwards, so that the spurs may be turned outward to the horse's belly; his left hand governing the horse's mouth, and his right the whip. During the whole time of the race, he must take care to sit firm in the saddle, without waving or standing up in the stirrups. Some jockies fancy the last a becoming seat, but it is certain, that all motions of this kind do really incommode the horse. In spurting the horse, it is not to be done by sticking the calves of the legs close to the horse's sides, as if it were intended to press the wind out of his body; but, on the contrary, the toes are to be turned a little outwards, that the heels being brought in, the spurs may just be brought to touch the sides. A sharp touch of this kind will be of more service toward the quickening of a horse's pace, and will sooner draw blood than one of the common coarse kicks. The expert jockey will never spur his horse until there is great occasion, and then he will avoid striking him under the fore bowels between the shoulders and the girth; this is the tenderest part of a horse, and a touch there is to be reserved for the greatest extremity.

6050. *As to whipping the horse*, it ought always to be done over the shoulder, on the near side, except in very hard running, and on the point of victory; then the horse is to be struck on the flank with a strong jerk; for the skin is the most tender of all there, and most sensible of the lash. When a horse is whipped and spurred, and is at the top of his speed; if he clap his ears in his pole, or whisk his tail, it is a proof that the jockey treats him hard, and then he ought to give him as much comfort as he can by

sawing the snaffle backward and forwards in his mouth, and by that means forcing him to open his mouth, which will give him wind, and be of great service. If there be any high wind stirring in the time of riding, the artful jockey will let his adversary lead, holding hard behind him, till he sees an opportunity of giving a loose; yet, in this case, he must keep so close behind, that the other horse may keep the wind from him; and that he, sitting low, may at once shelter himself under him, and assist the strength of the horse. If the wind happen to be in their back, the expert jockey is to keep directly behind the adversary, that he may have all the advantage of the wind to blow his horse along, as it were, and at the same time intercept it in regard to his adversary.

6051. *When running on level smooth ground*, the jockey is to beat his horse as much as the adversary will give him leave, because the horse is naturally more inclined to spend himself on this ground; on the contrary, on deep earths, he may have more liberty, as he will there spare himself.

6052. *In riding up hill* the horse is always to be favored, by bearing him hard, for fear of running him out of wind; but in running down hill, if the horse's feet and shoulders will bear it, and the rider dares venture his neck, he may have a full loose. If the horse have the heels of the rest, the jockey must always spare him a little, that he may have a reserve of strength to make a push at the last post.

6053. *On the jockey's knowing the nature of the horse that is to run against him*, a great deal depends; for by managing accordingly, great advantages are to be obtained: thus, if the opposite horse is of a hot and fiery disposition, the jockey is either to run just behind him, or cheek by jowl with him, making a noise with the whip, and by that means forcing him on faster than his rider would have him, and consequently, spending him so much the sooner; or else keep him just before him, in such a slow gallop, that he may either overreach, or by treading on the heels of the fore-horse, endanger tumbling over. Whatever be the ground that the adversary's horse runs worst on, the cunning jockey is to ride the most violently over; and by this means it will often happen, that in following he either stumbles or slips on the back sinews. The several corrections of the hand, the whip, and the spur, are also to be observed in the adversary, and in what manner he makes use of them: and when it is perceived by any of the symptoms of holding down the ears, or whisking the tail, or stretching out the nose like a pig, that the horse is almost blown, the business is to keep him on to this speed, and he will be soon thrown out or distanced. If the horse of the opponent looks dull, it is a sign his strength fails him; and if his flanks beat much, it is a sign that his wind begins to fail him, and his strength will soon do so too.

6054. *The after-management of a horse who has run*, includes the treatment between the heats, and the treatment after the race is over. After every heat for a plate, there must be dry straw, and dry clothes, both linen and woollen, ready to rub him down all over, after taking off the sweat with what is called a sweat-knife; that is, a piece of an old sword-blade, or some such thing. After the horse has been well rubbed, he should be chafed all over with cloths wetted in common water, till the time of starting again. When it is certainly known that the horse is good at the bottom, and will stick at the mark, he should be rid every heat to the best of his performance; and the jockey is, as much as possible, to avoid riding at any particular horse, or staying for any, but to ride out the whole heat with the best speed he can. If, on the contrary, he has a fiery horse to ride, and one that is hard to manage, hard-mouthed, and difficult to be held, he is to be started behind the rest of the horses with all imaginable coolness and gentleness; and when he begins to ride at some command, then the jockey is to put up to the other horses; and if they ride at their ease, and are hard held, they are to be drawn on faster; and if it be perceived that their wind begins to rake hot, and they want a sob, the business is to keep them up to that speed; and when they are all come within three quarters of a mile of the post, then is the time to push for it, and use the utmost speed in the creature's power.

6055. *When the race is over*, the horse is immediately to be clothed up and rode home; and immediately on his coming into the stable, the following drink is to be given him: Beat up the yolks of three eggs, and put them into a pint and a half of sound ale, made warm; and let it be given with a horn. After this, he is to be rubbed well down, and the saddle-place rubbed over with warm water and vinegar, and the places where the spurs have touched, with the same; after this he should have a feed of rye-bread, then a good mash, and at some time after them as much hay and oats as he will eat. His legs, after this, should be bathed some time with a mixture of vinegar and water.

SUBJECT. 2. *Of the Management and Working of the Hunter.*

6056. *The managing and working of the hunter* includes his preparation for hunting, his condition, and his treatment while taking his regular day's work in the field, whether after buck, fox, or hare hounds.

6057. *The preparation of the hunter* must, like that of the race horse, be commenced by an estimate of his state and condition. If taken fresh from grass, it should be in due time; first, that he may be well prepared; and next, because the grass does not yield much nutriment in the heat of summer. A still better method is to continue to let him run out in the day and graze, having a shed to house himself from heat and rain. He is also to be fed and exercised, nearly as in the common training, for hunting condition. In this way he is sure to be free from cracks, hidebound, or surfeit; and he will prove infinitely more hardy afterwards. It is even the practice with some of the best sportsmen, to allow their horses to run out all the hunting season, unless the weather be very severe; when they are only stabled in a loose place. They are allowed as much corn as they can eat, and are found, if a little rougher in their coats, infinitely superior in hardihood, and exemption from the dangers of cold.

6058. *A hunter taken from grass* or in very low case, should be treated as already fully detailed under condition. (5755.) Great care must be taken that all the alterations in heat of stable, clothing, feeding, &c., are gradually brought about; by which means his flesh will harden gradually, and by using first walking exercise, and increasing it as he advances in flesh and strength, his wind also will become excellent.

6059. *In the physicking of hunters*, particularly when they are low in flesh, much caution is requisite, that it be not over-done. It is the practice with some, and by no means a bad one, to give no physic; but to give more time in the preparation. Others again give mild grass physic, which is an excellent plan, when the weather is fine. (See physicking, 5875.)

6060. *The preparation of a hunter in full flesh and not from grass*, depends principally on regular exercise, and the best hard food; physicking him or not, according as he may be suspected to be foul, or as his wind may seem to want mending; but above all, whatever is done, should be done regularly; and

his exercise should be rather long continued than violent. Oats, with beans, are the proper hard food for hunters, taking care that the beans do not constipate the bowels; which must be obviated by bran mixed with the other food, if such should be the case. Bread is not necessary, but for tender delicate horses; but every thing should be of the best.

6061. *The day before a horse is to hunt* it is common to treat him somewhat differently, but which is seldom necessary. It is evident he should be well fed, and that not late at night, that he may lie down early. Some feed in the morning, which others avoid; but when it is considered, as has been fully explained (5731), how ill a horse bears fasting, it will be at once seen, that if very early in the morning, as by five o'clock, he could be fed with a moderate quantity of corn wetted, it would tend to support him through the day.

6062. *On the return of a horse from hunting*, the care bestowed on him should be extreme; as on it depends the immediate recovery of his strength. If he have fasted very long, and particularly if he be disinclined to eat of himself; horn down a pint of ale, with two pints of thick gruel. No prudent sportsman will bring in a horse hot; but if unavoidable accidents prevent this caution, let the horse be again led out for a few minutes, hooded and clothed; but he must have fresh clothes when afterwards dressed. Encourage him to stale as quickly as possible, after which proceed to hand-rub him all over carefully, placing before him a little of the best hay well sprinkled with water. If he refuse this, offer him three quarts of very clean chilled water. When perfectly cleaned, let his feet be carefully examined, that stubs have not pierced them, or that his shoes have not been forced awry, by over-reaching, or by the section of clayey ground; or that thorns be not lodged in his knees, hocks, and sinews. After all these matters have been well attended to, remove him from his stall to a loose box, well bedded up. A loose box is invaluable to a hunter; it gives room for stirring to prevent the swelling of the legs; and is better than bandaging when it can be avoided, which gives a disinclination to lie down. If the horse be off his food the next day, give him a cordial ball (*Vet. Pharm.* 5893) and a malt mash, and afterwards a few cut carrots, which will assist to bring him round more speedily.

SUBJECT. 3. *Of the Working and Management of Riding Horses.*

6063. *The working and managing of hackney or riding horses*, includes what is required for them as pleasure horses for ordinary airings; and what they require when used for purposes of travelling or long journeyings. It embraces also their stable management in general, with the proper care of horse and stable appointments: all which are usually entrusted to a servant, popularly called a groom, whose qualifications should be, moderate size, light weight, activity and courage, joined with extreme mildness and good temper; and above all, a natural love of horses, by which every thing required is done as a pleasure for the animal he loves, and not as a task for those he is indifferent to.

6064. *The hackney for gentlemen's airings* should be in high condition, because a fine coat is usually thought requisite, and here the groom ought to be diligent that he may keep up this condition by regularity and dressing, more than by heat, clothing, and cordials. Whenever his master does not use his horse, he must not fail to exercise him (but principally by walking) to keep up his condition, and to keep down useless flesh and swellings of the heels. The horse appointments are to be peculiarly bright and clean. The bridle should be belleted and buckled, that the bits may be removed to clean them without soiling the leather, and which cleaning ought not to be done with rough materials, but fine powder and polishing. On the return from exercise, they should be wiped dry and then oiled. Two pair of girths should be used, that a clean pair may always be ready, and the same if saddle cloths are used.

6065. *The preparation for, and the care of a horse on a journey* involve many particulars which should not escape the eye of the master. The first is, Is the horse in hard travelling condition? Next, Do his appointments all fit, and are they in proper order? The bridle for journeying should always be a double curb one. The snaffle can be ridden with, certainly; but the snaffle cannot do the work of the curb, in staying a horse, in saving him from the ground under stumbling or fatigue; or throwing him on his haunches; or in lightening his mouth. The bridle should not be new, but one to which the horse is accustomed. It is of still more consequence that the saddle be one that the horse has worn before, and that fits him thoroughly. The girths should also be of the best material to prevent accidents; and if the saddle be liable to come forward, however objectionable the appearance, a crupper had better be used. Some days before a long journey is attempted, if the shoes are not in order, shoe the horse; but by no means let it be done as you set off, otherwise having proceeded on the journey a few miles, you find that one foot is pricked, and lameness ensues; or, if this be not the case, one or more shoes pinch, or do not settle to the feet; all which cannot be so well altered as by your own smith.

6066. *It is always best to begin a long journey by short stages*, which accustoms the horse to continued exertion. This is the more particularly necessary if he have not been accustomed to travel thus, or if he be not in the best condition. The distance a horse can perform with ease depends greatly on circumstances. Light carcase horses, very young ones, and such as are low in flesh, require often baiting, particularly in hot weather: horses in full condition, above their work, and well carcase, and such as are from seven, or ten, or twelve years old, are better when ridden a stage of fifteen or twenty miles, with a proportionate length of baiting time afterwards, than when baited often, with short stoppages: the state of the weather should also be considered; when it is very hot the stages should be necessarily shorter.

6067. *To a proper consideration of the baiting times on a journey*, the physiology of digestion should be studied. (5127.) Fatigue weakens the stomach; when we ourselves are tired, we seldom have much inclination to eat, and fatigue also prevents activity in the digestive powers. To allay these consequences, ride the horse gently the last two or three miles. If a handful of grass can be got at the road side, it will wonderfully refresh your horse, and not delay you three minutes. In hot weather, let the horse have two or three go downs (gulps), but not more, of water occasionally as you pass a pond; this tends to prevent excessive fatigue. Occasionally walk yourself up hill, which greatly relieves him, and at which time, remove the saddle, by shifting which, only half an inch, you greatly relieve him; and during this time, perhaps he may stale, which also is very refreshing to him. It may be as well, in a flinty country, to take this opportunity of examining that no stones are got into the feet likewise.

6068. *When a horse is brought into an inn from his journey*; if he be very hot, first let him be allowed time to stale; let his saddle be taken off, and with a sweat knife draw the perspiration away; then, with a rug thrown over him, let him be led out and walked in some sheltered place till cool, by which means he will not afterwards break out into a secondary and hurtful sweat; but by no means let an idle ostler hang him to dry without the stable. Being now dried, remove him to the stable, where, let some good hay, sprinkled with water, be placed before him: if very thirsty, give three or four quarts of water now, and the remainder in half an hour, and then let him be thoroughly dressed, hand-rubbed, foot-picked, and foot-washed; but by no means let him be ridden into water; or, if this practice is customary, and cannot be avoided, let it be not higher than the knees, and afterwards insist on the legs being rubbed perfectly dry; but good hand-rubbing and light sponging is better than washing. Having thus made him comfortable, proceed to feed him with corn and beans according as he is used.

6069. *To feed a horse when very hard ridden, or if weakly and tender*, it is often found useful to give bread, or bread with ale: if this be also refused, horn down oatmeal and ale, or gruel and ale. It is of

the utmost consequence if the journey is to be of several days continuance, or if it is to consist of a great distance in one or two days, that the baitings are sufficiently long to allow the horse to digest his food: digestion does not begin in less than an hour, and is not completed in less than three; consequently any bait that is less than two hours, fails of its object; and such a horse rather travels on his former strength than on his renewed strength, and therefore it cannot continue. After a horse is fed he will sometimes lie down; by all means encourage this, and if he is used to do it, get him a retired corner stall for the purpose.

6070. *The night baiting of a journeying horse* should embrace all the foregoing particulars, with the addition of foot stopping; and care that his stable be of the usual temperature to that to which he is accustomed; and that no wind or rain can come to him: give him now a full supply of water; if he has been at all exposed to cold, mash him, or, if his dung be dried by heat, do the same; otherwise, let a good proportion of oats and beans be his supper, with hay, not to blow on half the night, but enough only to afford nutriment.

6071. *When returned home from a journey*; if it has been a severe one, let the horse have his fore shoes taken off, and, if possible, remove him to a loose box, with plenty of litter; but if the stones be rough, or the pavement be uneven, put on tips, or merely loosen the nails of those shoes he has on; keep the feet continually moist by a wet cloth, and stop them at night if the shoes be left on; mash him regularly, and if very much fatigued, or reduced, let him have malt or carrots, and if possible, turn him out an hour or two in the middle of the day to graze: bleeding or physicking are unnecessary, unless the horse shows signs of fear. If the legs be inclined to swell, bathe them with vinegar and chamber-lye, and bandage them up during the day, but not at night, and the horse will soon recover to his former state.

SUBJECT. 4. *Of Horses in Curricles and Coaches.*

6072. *In working and managing horses in curricles*, two wheel chaises, and similar cases, great feeling and nicety is required, not to overload or overdrive the animal; to see that the weight is duly proportioned between the wheels and horse's back, and that the harness does not pinch; but no directions on this head can be of much use, unless the driver be a humane and considerate person, and one who sets a just value on the services of the noble animal committed to him. In Russia, the drivers of two wheel carriages, as droschneys, sledges, and others, corresponding to our gigs and curricles, have a barbarous custom of teaching the horses to turn round their heads, the one to the left, and the other to the right (fig. 635.), the sight of which is very offensive to a stranger.



6073. *In working and managing coach horses*, the same attention to grooming in all its departments is required as for saddle horses. Coach horses should never be brought into full work before they are five years old: when well fed on hard food they may be worked at an average of thirty miles a day at twice. In general they should not be longer than five or six hours in the yoke at a time. Their principal meals should be in the morning and after their work is over for the day, as the action of trotting fast materially impedes digestion.

SUBJECT. 5. *Working of Cart, Waggon, and Farm Horses.*

6074. *In working and managing cart and waggon horses*, a similar attention is requisite as for coach horses, though perhaps in a somewhat less degree, the animal being hardier.

6075. *The working and managing of farm horses* includes the age at which they are put to work, the quantity of work they should perform, and their feeding and general management.

6076. *The age at which horses are put to full work, in the labors of a farm*, is usually when four or five years old, according to the nature of the soil; and the numbers of the team; but they are always understood to be able to pay for their maintenance after they are three years old, by occasional work in ploughing and harrowing. Brown thinks it probable they might be put to work at four years old, were the same attention paid to their breeding and rearing, that is paid to cattle and sheep.

6077. *The work which a farm horse ought to perform* is evidently a question of circumstances, which does not admit of any precise solution, a two-horse plough may, on an average, work about an English acre a day throughout the year; and, in general, according to the nature of the soil, and the labor that has been previously bestowed on it, a pair of horses, in ploughing, may travel daily from ten to fifteen miles, overcoming a degree of resistance equal to from four to ten hundred weight. On a well made road, the same horses will draw about a ton in a two wheeled cart for twenty or twenty-five miles every day; and one of the better sort, in the slow movement of the carrier or waggoner, commonly draws this weight by himself on the best turnpike roads. In some places horses are in the yoke, when the length of the day permits, nine hours, and in others ten hours a day, but for three or four months in winter, only from five to eight hours. In the former season they are allowed to feed and rest two hours from mid-day, and in the latter they

have a little corn on the field, when working as long as there is day light, but none if they work only five or six hours. (*Sup. Enc. Brit. art. Agr.*)

6078. *The feeding of farm horses* is a subject of great agricultural importance, and has excited considerable discussion among speculative agriculturists, who have generally urged the great expenses attending it as an argument against horses, in favor of oxen. Others, without preferring oxen to horses, have, instead of corn and hay, proposed to feed them on roots, leaves, whins, and even haws from the hedges. The latter have been given in large quantities by West, of Hampshire, and it is said (*Complete Farmer, art. Team.*) were found to answer. That horses as well as men may live on very inferior food is evident; but that either will be able to perform their work under such treatment, as well as if they were properly nourished, is contrary to reason and experience. It is observed by the judicious writer so often quoted, that horses can never perform their labor according to the present courses of husbandry, on carrots, turnips, potatoes, or other roots alone, or as their chief food. They will work and thrive on such food, but they will work as much more, and thrive as much better with oats or beans in addition, as fully to repay the difference in expense. One of the three meals a day, which farm horses usually receive, may consist of roots; and a few of them, every twenty-four hours, are highly conducive to the health of the animals: but we have never had occasion to see any horse work regularly throughout the year, in the way they are usually worked in the best cultivated districts, without an allowance of at least an English peck of oats, or mixed oats and beans, daily, less or more at particular periods, but rather more than this quantity for at least nine months in the year.

6079. *Brown* does not approve of giving much grain to young horses, thinking it expensive, and not so conducive to their health as when they are supported on green food. In the winter and spring months, a few turnips are eminently beneficial to young horses, by keeping their blood in good order, swelling their bone, and hastening their growth. A plentiful supply of grass in summer ought always to be allowed, as their condition through the winter depends greatly upon that circumstance. It is an object deserving of attention, that flesh once gained ought never to be lost, but that every animal whatever should be kept in a progressive state of improvement, and not suffered to take a retrograde course, which afterwards must be made up by extra feeding, or a loss be sustained, in a direct proportion to the degree of retrogradation that has actually occurred.

6080. *The leanness of a farmer's working cattle*, and their reluctant movements under this severe stimulus, clearly marks his unprosperous condition. There are particular operations, indeed, such as turnip-sowing, seedling, fallows, harvest work, &c., which require to be executed with so great dispatch, in our variable climate, that unusual exertions are often indispensable. At these times, it is hardly possible, by the richest food and the most careful treatment, to prevent the animals from losing flesh, sometimes even when their spirit and vigor are not perceptibly impaired. Such labors, however, do not continue long, and should always be followed by a corresponding period of indulgence. It is particularly dangerous and unprofitable, to begin the spring labor with horses worn down by bad treatment during winter. (*Sup. &c.*)

6081. *Donaldson* observes, that the coarse garbage with which farm horses are commonly stuffed, profitably or otherwise, is the real cause of the frequent occurrence among them of blindness, grease, and colic; more particularly the last, which, with care, might be prevented from happening so frequently. The remedy lies in physic, once or twice a-year; either the regular aloetic dose, or salts given in pails of warm water, or sulphur and cream of tartar; one third of the latter mixed in the corn. All horses kept in the stable become, more or less, internally loaded; and it is an error, to suppose cart-horses are not equally benefitted with others by purging physic.

6082. *The cleaning and dressing of farm horses* was formerly very little attended to; but at present its importance to the health of the animal is better understood. *Donaldson* recommends that the heels, legs, bend of the knee, and hock, the twist under the flanks; in short, all parts out of sight, of cart-horses, whilst standing in the house, should be kept perfectly free from dirt and scurf, and the skin supple; the parts more in sight will take care of themselves. In a deep country, it is much the better practice, notwithstanding the prejudice to the contrary, to trim their legs coach-horse fashion. It is now well understood, the editor of *The Farmer's Magazine* observes, that the liberal use of the brush and the curry-comb twice a day; frequent but moderate meals, consisting of a due proportion of succulent joined to more solid food; abundance of fresh litter, and great attention to method and cleanliness, are as indispensable in the stable of a farmer (as far as is consistent with a just regard to economy), as they have always been held to be in the treatment of horses kept for pleasure. Good dressing, with all well-informed and attentive men, is considered to be no less necessary to the thriving of the horses than good feeding; according to a common expression, it is equal to half their food.

6083. *The general management of farm horses in the improved districts of the north*, may be presented as a good example. There, for about four months in summer, horses are fed on pastures; or on clover and rye-grass, and tares cut green, and brought home to the stable or fold-yard; the latter method being by far the most economical and advantageous. For the other eight months, they are kept on the straw of oats, beans, and peas, and on clover and rye-grass hay. As soon as the grass fails towards the end of autumn, they have hay for a few weeks, and when the days become so short as to allow

of no more than from six to eight hours' work, they are very generally fed with different kinds of straw, according to the circumstances of the farm; in the month of March they are again put to hay till the grass is ready for being cut. Throughout all the year they are allowed more or less corn, when constantly worked; and during the time they are on dry fodder, particularly when on straw, they have potatoes, yams, or Swedish turnips, once a day, sometimes boiled barley, and, in a few instances, carrots. A portion of some of these roots is of great importance to the health of horses, when succulent herbage is first exchanged for hay at the end of autumn; and it is no less so towards the latter end of spring, when hay has become sapless, and the labor is usually severe. At these two periods, therefore, it is the practice of all careful managers, to give an ample allowance of some of these roots, even though they should be withheld for a few weeks during the intermediate period.

6084. *The quantity of these different articles of food must depend on the size of the horses, and the labor they perform; and the value upon the prices of different seasons, and, in every season, on the situation of the farm with respect to markets, particularly for hay and roots, which bring a very different price near large towns, and at a few miles distant. It is for these reasons, that the yearly expense of a horse's maintenance has been estimated at almost every sum, from 15*l.* to 40*l.* But it is only necessary to attend to the expense of feeding horses that are capable of performing the labor required of them, under the most correct and spirited management. Such horses are fed with oats, sometimes with beans, three times a day, for about eight months; and twice a day for the other four, when at grass; and, at the rate of eight feeds per bushel, each horse will eat fifteen quarters of oats, or twenty bolls Linlithgow measure in the year. When on hay, he will require about one stone of twenty-two pounds *avoirdupois* daily, and five pounds more if he does not get roots. One English acre of clover and rye-grass, and tares, may be necessary for four months' soiling; and a quarter of an acre of potatoes, yams, or Swedish turnips, during the eight months he is fed with hay or straw. The use of these roots may admit of a small diminution of the quantity of corn in the winter months, or a part of it may be, as it almost always is, of an inferior quality.*

6085. *The expense of feeding a horse throughout the year, may therefore be estimated, in regard to quantities, as follows:*

Oats, fifteen quarters.

Soiling, one acre of clover and rye-grass, and tares.

Hay part of October and November, March, April, and

May, 1½ tons.

Straw for other four months, half the price of hay.

Potatoes, yams, or Swedish turnips, ½ acre.

(Supp. &c. art. Agr.)

6086. *The extent of land required for a horse's maintenance, supposing the soil to be of a medium quality, may be about five acres; that is, for oats three acres, soiling one, and one more for hay and roots. On rich soils four acres will be sufficient, but on poor soils, and wherever horses are kept at pasture, the produce of six acres and a half, or seven acres, will be consumed by one of them, when worked in the manner already mentioned. The straw of about two acres must be allowed for fodder and litter, the last of which has not been stated above, because, at a distance from towns, what is allowed for litter must at any rate be converted into dung. If sixty acres, therefore, should be assumed as the average extent of land that may be kept in cultivation by two horses, according to the best courses of modern husbandry, the produce of ten acres of this will be required for their maintenance; or, a horse consumes the produce of one acre out of every six which he cultivates, according to a four or six years' course, and sometimes more than one acre out of every five which he ploughs annually. (General Report of Scotland, vol. iii. p. 192.)*

CHAP. II.

The Ass. — Equus Asinus, L. Ane, Fr.; Esel, Ger.; Amu, Span. and Asino, Ital.

6087. *The ass is a native of the mountainous deserts of Tartary, of Arabia, Persia, and other parts of the Asiatic continent; and at present is very generally domesticated throughout most civilized countries. The wild ass feeds chiefly on the most saline or bitter plants of the desert, as the kalis, atriplices, chenopodium, &c.; and also prefers the saltest and most brackish water to that which is fresh. Of this the hunters are aware, and usually station themselves near the ponds to which they resort to drink. Their manners greatly resemble those of the wild horse. They assemble in troops under the conduct of a leader, or centinel; and are extremely shy and vigilant. They will, however, stop in the midst of their course, and even suffer the approach of man, and then dart off with the utmost rapidity. They have been at all times celebrated for their swiftness. Their voice resembles that of the common ass, but is shriller.*

horned breed, when properly fed, victual the East India ships, as they produce the thickest beef, which, by retaining its juices, is the best adapted for such long voyages. Our royal navy should also be victualled from these; but by the jobs made by contractors, and other abuses, it is feared our honest tars are often fed with beef of an inferior quality; however, the coal ships from Newcastle, Shields, Sunderland, &c. are wholly supplied with the beef of these valuable animals. These oxen commonly weigh from sixty to a hundred stone (fourteen pound to the stone), and they have several times been fed to one hundred and twenty, one hundred and thirty, and some particular ones to upwards of one hundred and fifty stone, the four quarters only. (*Culley*, p. 48.)

6110. In comparing the breeds of long and short-horned cattle, *Culley* observes, that the long-horns excel in the thickness and firm texture of the hide, in the length and closeness of the hair, in their beef being finer grained, and more mixed and marbled than that of the short-horns, in weighing more in proportion to their size, and in giving richer milk; but they are inferior to the short-horns, in giving a less quantity of milk, in weighing less upon the whole, in affording less tallow when killed, in being generally slower feeders, and in being coarser made and more leathery or bullish in the under side of the neck. In few words, says he, the long-horns excel in the hide, hair, and quality of the beef; the short-horns in the quantity of beef, tallow, and milk. Each breed has long had, and probably may have, its particular advocates; but if he may hazard a conjecture, is it not probable that both kinds may have their particular advantages in different situations? Why not the thick, firm hides, and long close-set hair of the one kind, be a protection and security against those impetuous winds and heavy rains to which the west coast of this island is so subject; while the more regular seasons and mild climate upon the east coast are more suitable to the constitutions of the short-horns.

6111. The middle-horned breeds comprehend in like manner, several local varieties, of which, the most noted are the *Devons*, the *Sussexes*, and the *Herefords*; the two last, according to *Culley*, being varieties of the first, though of a greater size, the *Herefords* being the largest. These cattle are the most esteemed of all our breeds for the draught, on account of their activity and hardiness; they do not milk so well as the short-horns, but are not deficient in the valuable property of feeding at an early age, when not employed in labor.

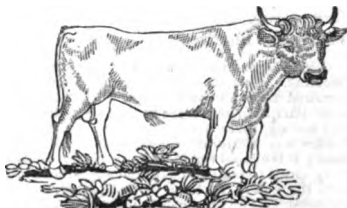
6112. The *Devonshire cattle* (fig. 642.) are of a high red color (if any white spots, they reckon the breed impure, particularly if those spots run one into another), with a light-dun ring round the eye, and the muzzle of the same color, fine in the bone, clean in the neck, horns of a medium length, bent upwards, thin-faced, and fine in the chops, wide in the hips, a tolerable barrel, but rather flat on the sides, tail small, and set on very high; they are thin skinned, and silky in handling, feed at an early age, or arrive at maturity sooner than most other breeds. (*Culley*, p. 51).

Another author observes, that they are a model for all persons who breed oxen for the yoke. (*Parkinson on Live Stock*, vol. i. p. 112). The weight of the cows is usually from thirty to forty stone, and of the oxen from forty to sixty; the North Devon variety, in particular, from the fineness in the grain of the meat, is held in high estimation in Smithfield. (*Dickson's Practical Agriculture*, vol. ii. p. 120).

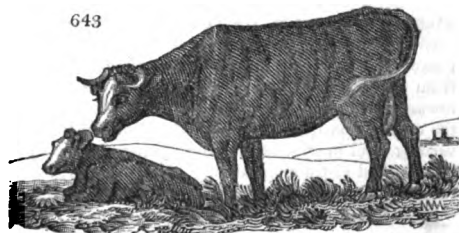
6113. *Lawrence* says, that the red cattle of North Devon and Somerset are doubtless one of our original breeds, and one of those which has preserved most of its primitive form: the excellence of this form for labor is best proved by the fact, that the fashionable substitution of horses has made no progress in the district of these cattle, by their high repute as feeders, and for the superior excellence of their beef, which has been acknowledged for ages. They are, he says, the speediest working oxen in England, and will trot well in harness; in point of strength, they stand in the fourth or fifth class. They have a greater resemblance to deer than any other breed of neat-cattle. They are rather wide, than middle-horned, as they are sometimes called; some, however, have regular middle horns, that is, neither short nor long, turned upward and backward at the points. As milkers, they are so far inferior to both the long and short-horns, both in quantity and quality of milk, that they are certainly no objects for the regular dairy, however pleasing and convenient they may be in the private family way.

6114. The *Sussex and Herefordshire cattle* (fig. 643.) are of a deep red color, with fine hair and very thin hides; neck and head clean, the face usually white, horns neither long nor short, rather turning up at the points; in general, they are well made in the hind quarters, wide across the hips, rump, and sirloin, but narrow in the chine, tolerably straight along the back, ribs too flat, thin in the thigh, and bone not large. An ox, six years old, when fat, will weigh from sixty to one hundred stone, the fore-quarters generally the heaviest; the oxen are mostly

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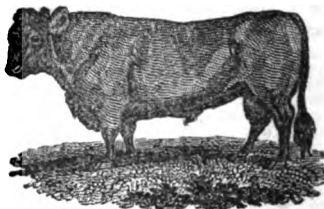


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worked from three to six years old, sometimes till seven, when they are turned off for feeding. The Hereford cattle are next in size to the Yorkshire short-horns: both this and the Gloucester variety are highly eligible as dairy stock, and the females of the Herefords have been found to fatten better at three years old than any other kind of cattle except the spayed heifers of Norfolk. (*Marshal's Economy of Gloucestershire.*)

6115. *The polled or hornless breeds.* The most numerous and esteemed variety is the Galloway breed (*fig. 644.*), so called from the province of that name, in the south-west of Scotland, where they most abound. The true Galloway bullock "is straight and broad on the back, and nearly level from the head to the rump, broad at the loins, not, however, with hooked bones, or projecting knobs, so that when viewed from above, the whole body appears beautifully rounded; he is long in the quarters, but not broad in the twist; he is deep in the chest, short in the leg, and moderately fine in the bone, clean in the chop and in the neck; his head is of a moderate size, with large rough ears, and full, but not prominent eyes, or heavy eyebrows, so that he has a calm though determined look; his well-proportioned form is clothed with a loose and mellow skin, adorned with long soft glossy hair." (*Galloway Report*, p. 236.) The prevailing color is black or dark-brindled, and, though they are occasionally found of every color, the dark colors are uniformly preferred, from a belief that they are connected with superior hardness of constitution. The Galloways are rather undersized, not very different from the size of the Devons, but as much less than the long horns, as the long horns are less than the short horns. On the best farms, the average weight of bullocks three years and a half old, when the greater part of them are driven to the south, has been stated at about forty stone, *avoirdupois*; some of them, fattened in England, have been brought to nearly one hundred stone.



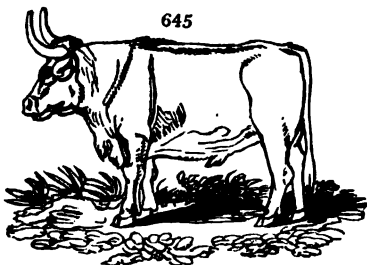
6116. *The general properties of this breed* are well known in almost every part of England, as well as in Scotland. They are sometimes sent from their native pastures directly to Smithfield, a distance of four hundred miles, and sold at once to the butcher; and in spring, they are often shown in Norfolk, immediately after their arrival, in as good condition as, or even better than, when they began their journey; with full feeding, there is perhaps no breed that sooner attains maturity, and their flesh is of the finest quality. Culley was misinformed about the quantity of milk they yield, which, though rich, is by no means abundant; it is alleged not to be more than seventy or eighty years since the Galloways were all horned, and very much the same in external appearance and character, with the breed of black cattle which prevailed over the west of Scotland at that period, and which still abound in perfection, the largest sized ones in Argyshire, and the smaller in the Isle of Skye; the Galloway cattle, at the time alluded to, were coupled with some hornless bulls, of a sort which do not seem now to be accurately known, but which were then brought from Cumberland, the effects of which crossing were thought to be the general loss of horns in the former, and the enlargement of their size: the continuance of a hornless sort being kept up by selecting only such for breeding, or, perhaps, by other means, as by the practice of eradicating with the knife, the horns in their very young state. (*Coventry on Live Stock*, p. 28.)

6117. *The Suffolk duns*, according to Culley, are nothing more than a variety of the Galloway breed: he supposes them to have originated in the intercourse that has long subsisted between the Scotch drovers of Galloway cattle, and the Suffolk and Norfolk graziers who feed them. The Suffolks are almost all light duns, thus differing from the Galloways, and are considered a very useful kind of little cattle, particularly for the dairy. (*Culley*, p. 66. *Parkinson*, vol. i. p. 116.)

6118. *The cattle of the Highlands of Scotland* are divided into a number of local varieties, some of which differ materially from others, probably owing to a difference in the climate and the quality of the herbage, rather than to their being sprung from races originally distinct, or to any great change effected either by selection or by crossing with other breeds. It is only of late that much attention has been paid to their improvement, in any part of this extensive country; and in the northern and central Highlands the cattle are yet, for the most part, in as rude a state, and under management as defective, as they were some centuries ago. These cattle have almost exclusive possession of all that division of Scotland, including the Hebrides, marked off by a line from the Frith of Clyde on the west, to the Murray Frith on the north, and bending towards the east till it approaches in some places very near to the German ocean. Along the eastern coast, north of the Frith of Forth, the Highland cattle are intermixed with various local breeds, of which they have probably been the basis. There are more or less marked distinctions among the cattle of the different Highland counties; and, in common language, we speak of the Inverness-shire, the Banffshire, &c. cattle, as if they were so many separate breeds; but it is only necessary in this place to notice the two more general varieties, now clearly distinguishable by their form, size, and general properties.

6119. The most valuable of these are the cattle of the *Western Highlands and Isles*,

commonly called the *Argyleshire breed* (fig. 645.), or the breed of the Isle of Skye, one of the islands attached to the county of Argyle. The cattle of the Hebrides are called *kyloes*, a name which is often applied in the south to all the varieties of the Highland cattle, not as a late writer (*Dickson's Practical Agriculture*, vol. ii. p. 1124.) has imagined, from the district in Ayrshire called Kyle, where very few of them are kept, but from their crossing, in their progress to the south, the *kyloes* or *ferries* in the mainland and Western Islands, where these cattle are found in the greatest perfection. (*General Report of Scotland*, vol. iii. p. 26.)



6120. *A bull of the Kyloe breed* should be of a middle size, capable of being fattened to fifty stone avoirdupois. His color should be black or dark brown, or reddish brown, without any white or yellow spots. His head should be rather small, his muzzle fine, his horns equable, not very thick, of a clear green and waxy tinge; his general appearance should combine agility, vivacity, and strength; and his hair should be glossy, thick, and vigorous, indicating a sound constitution and perfect health. For a bull of this description, Macneil, of Colonsay, in 1812, refused 200 guineas; and for one of an inferior sort he actually received 170*l.* sterling. Macdonald, of Staffa, bought one, nine years old, at 100 guineas. (*Report of the Hebrides*, p. 425.)

6121. *The lean weight* of the best stock, from three to four years old, when they are commonly sold to the south, is from twenty-six to thirty stone the four quarters; but when brought to good pastures, they can be easily raised to fifty stone and upwards. There is, perhaps, no other breed whose weight depends so much on feeding; nor any that fattens and grows so much at the same time. They are exceedingly hardy, easily maintained, speedily fattened on pastures where large animals could scarcely subsist; their beef is fine in the grain, and well marbled or intermixed with fat; and their milk is rich, but small in quantity.

6122. The other variety of Highland cattle is the *Norlands*, or *North Highlanders*, including the stocks of the counties of Ross, Cromarty, Sutherland, Caithness, and parts adjacent. Their hides are generally coarse; backs high and narrow; ribs flat; bones large; and legs long and feeble for the weight of the chest; and they are considered very slow feeders. But though this description be but too applicable to the cattle of the greater part of that remote district, considerable improvement has been effected in many parts of it, by crossing with the Skye or Argyle breeds, within the last twenty years.

6123. *The cattle of Orkney and Zeland*, are of a most diminutive size; an ox weighing about sixty pounds a quarter, and a cow forty-five pounds. They are of all colors, and their shapes are generally bad; yet they give a quantity of excellent milk; fatten rapidly when put on good pastures; and, in their own district, are considered strong, hardy, and excellent workers, when well trained to the yoke, and so plentifully fed as to enable them to support labor.

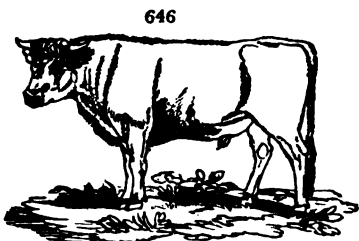
6124. *Of the Fifeshire cattle*, Culley observes, "you would at first imagine them distinct breed, from their upright white horns, being exceedingly light lyered and thin thighed, but I am pretty clear it is only from their being more nearly allied to the kyloes, and consequently less of the coarse kind of short horns in them." (*Culley*, p. 69.) Notwithstanding this opinion, the cattle of the North-eastern counties of Scotland require, for every useful purpose, to be mentioned separately from the Highland herds; and as all of them have a general resemblance, it will only be necessary in this place to notice the Fife cattle in particular. There are various traditions about the origin of this variety. It is said to have been much improved by English cows sent by Henry VII. to his daughter, the consort of James IV. who usually resided at the palace of Falkland, in that county; and as there is some resemblance between the cattle of Fife and Cambridgeshire, they are supposed to have been brought originally from the latter county. Others ascribe the origin of the present breed to bulls and cows sent by James VI. (James I. of England), in payment of the money which his obliging neighbors in Fife are said to have advanced for his equipment, when he went to take possession of the English throne. (*Report of Nairn and Moray*, p. 305.)

6125. *The prevailing color of the Fife cattle* is black, though sometimes spotted or streaked with white, and some of them are altogether grey. The horns are small, white, generally pretty erect, or at least turned up at the points, bending rather forward, and not wide spread like the Lancashire long-horned breed. The bone is small in proportion to the carcase; the limbs clean, but short; and the skin soft. They are wide between the hook-bones; the ribs narrow, wide set, and having a great curvature. They fatten quickly, and fill up well at all the choice points; are hardy, fleet, and travel well, and are excellent for labor, both at plough and cart. A good cow of this breed gives from eighteen to twenty-four quarts of milk per day, yielding from seven to nine pounds of butter, and from ten to twelve pounds of cheese per week (twenty-four ounces to the pound) for some months after calving. (*Fife Report*, p. 251. and 253.)

6126. *The cattle of Aberdeenshire*, the largest of which are said to have been produced by crossing with Fife bulls, have been long highly esteemed in the southern markets. It is observed, that every succeeding generation of them has increased in size, for the last thirty years; and that the native breed has doubled its former weight since

the introduction of turnips. (*Aberdeenshire Report*, p. 468.) The color is commonly black, but there are many of a red and brindled color. They are thinner in the buttock, in proportion to their weight; and deeper in the belly, in proportion to their circumference, than the west Highlanders, and they yield a much larger quantity of milk. Many of them are brought to the south of Scotland, and kept during winter in the straw yards, for which they suit better than smaller cattle, as they are not so impatient of confinement. The ordinary weight of middle-sized oxen, at from three to five years old, is from forty to fifty stone; but after being worked for some time, and thoroughly fattened, they have been known to reach double this weight.

6127. *Of the Welsh cattle*, (fig. 646.) "there seem to be two distinct kinds. The large sort are of a brown color, with some white on the rump and shoulders, denoting a cross from the long-horns, though in shape not the least resembling them. They are long in the legs, stand high according to their weight, are thin in the thigh, and rather narrow in the chine; their horns are white and turned upwards; they are light in flesh, and next to the Devons, well formed for the yoke; have very good hoofs, and walk light and nimble. The other sort are much more valuable; color black, with very little white; of a good useful form, short in the leg, with round deep bodies; the hide is rather thin, with short hair; they have a likely look and a good eye; and the bones, though not very small, are neither large nor clumsy; and the cows are considered good milkers." (*Parkinson on Live Stock*, vol. i. p. 135.)



6128. *The Alderney cattle* are to be met with only about the seats of a few great landholders, where they are kept chiefly for the sake of their milk, which is very rich, though small in quantity. This race is considered, by very competent judges, as too delicate and tender, to be propagated to any extent in Britain, at least in its northern parts. Their color is mostly yellow or light red, with white or mottled faces; they have short crumpled horns, are small in size, and very ill shaped; yet they are fine boned in general; and their beef, though high colored, is very well flavored. I have seen, says Culley, some very useful cattle bred from a cross between an Alderney cow and a short horned bull.

6129. *The Irish cattle*, Culley thinks, are a mixed breed between the long-horns and the Welsh or Scotch, but more inclined to the long-horns, though of less weight than those in England.

6130. The last variety of cattle we shall mention is one entirely of luxury, it is the *wild breed*, (fig. 647.) which is found only in the parks of a few great proprietors, who

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preserve the animals as curious and ornamental, or for the sake of their high-flavored beef. Those kept at Chillingham Castle, in Northumberland, a seat belonging to the Earl of Tankerville, have been very accurately described in the *Northumberland Report*, and in Culley's book on live stock, so often quoted. Their color is invariably of a creamy white; muzzle black; the whole of the inside of the ear, and about one-third of the outside, from the tips downward, red; horns white, with black tips, very fine, and bent upwards; some of the bulls have a thin upright mane, about an inch and a half, or two inches long. The weight of the oxen is from thirty-five to forty-five stone,

and the cows from twenty-five to thirty-five stone the four quarters (fourteen pounds to the stone). The beef is finely marbled, and of excellent flavor. From the nature of their pasture, and the frequent agitation they are put into by the curiosity of strangers, it is scarcely to be expected they should get very fat; yet the six years old oxen are generally very good beef, from whence it may be fairly supposed that, in proper situations, they would feed well.

6131. *The habits* of these animals are entirely rude; at the first appearance of any person they set off in full gallop, and, at the distance of about two hundred yards, make a wheel round and come boldly up again, tossing their heads in a menacing manner; on a sudden they make a full stop, at the distance of forty or fifty yards, looking wildly at the object of their surprise, but, upon the least motion being made, they all again turn round, and fly off with equal speed, but not to the same distance, forming a shorter circle, and again returning with a bolder and more threatening aspect than before; they approach much nearer, probably within thirty yards, when they again make another stand, and again fly off: this they do several times, shortening their distance, and advancing nearer and nearer till they come within such a short distance, that most people think it prudent to leave them, not choosing to provoke them further.

6132. *When the cows calve*, they hide their calves for a week or ten days in some sequestered situation, and go and suckle them two or three times a day. If any person come near the calves, they clap their heads close to the ground, and lie like a hare in form, to hide themselves. This is a proof of their native wildness, and is corroborated by the following circumstance that happened to the writer of this narrative, (Bailey, of Chillingham), who found a hidden calf, two days old, very lean and very weak. On stroking its head it got up, pawed two or three times like an old bull, bellowed very loud, stepped back a few steps, and bolted at his legs with all its force; it then began to paw again, bellowed, stepped back, and bolted as before; but knowing its intention, and stepping aside, it missed him, fell, and was so very weak that it could not rise, though it made several efforts; but it had done enough: the whole herd were alarmed, and, coming to its rescue, obliged him to retire; for the dams will allow no person to touch their calves without attacking them with impetuous ferocity.

6133. *When a calf is intended to be castrated*, the park-keeper marks the place where it is hid, and when the herd are at a distance, takes an assistant with him on horseback; they tie a handkerchief round the calf's mouth to prevent its bellowing, and then perform the operation in the usual way, with as much expedition as possible. When any one happens to be wounded, or is grown weak and feeble through age or sickness, the rest of the herd set upon it and gore it to death. (Culley, p. 73.)

6134. *The mode of killing them* was, perhaps, the only modern remains of the grandeur of ancient hunting. On notice being given that a wild bull would be killed on a certain day, the inhabitants of the neighborhood came mounted and armed with guns, &c., sometimes to the amount of an hundred horse, and four or five hundred foot, who stood upon walls or got into trees, while the horsemen rode off the bull from the rest of the herd, until he stood at bay, when a marksman dismounted and shot. At some of these huntings, twenty or thirty shots have been fired before he was subdued. On such occasions, the bleeding victim grew desperately furious from the smarting of his wounds, and the shouts of savage joy that were echoing from every side. But, from the number of accidents that happened, this dangerous mode has been little practised of late years, the park-keeper alone generally shooting them with a rifled gun at one shot.

SUBJECT. 2. *Criteria of Cattle for various objects and purposes.*

6135. *The criteria of a well-made bull*, to whatever breed he belongs, are according to Culley as follows: the head should be rather long, and the muzzle fine; his eyes lively and prominent, his ears long and thin, his horns wide, his neck rising with a gentle curve from the shoulders, and small and fine where it joins the head; the shoulders moderately broad at the top, joining full to his chine or crops and chest backwards, and to the neck-vein forwards; his bosom open, breast broad, and projecting well before his legs; his arms or fore-thighs muscular, and tapering to his knee; his legs strait, clean, and very fine-boned; his chine and chest so full as to leave no hollows behind the shoulders; the plates strong, to keep his belly from sinking below the level of his breast; his back or loin broad, straight, and flat; his ribs rising one above another in such a manner that the last rib shall be rather the highest, leaving only a small space to the hips or hooks, the whole forming a round or barrel-like carcase; his hips should be wide placed, round, or globular, and a little higher than the back; the quarters from the hip to the rump long, and instead of being square, as recommended by some, they should taper gradually from the hips backward, and the turfs or pott-bones not in the least protuberant; rumps close to the tail, the tail broad, well haired, and set on so high as to be in the same horizontal line with his back. Bulls should be constantly well fed, and kept in proper enclosures, never being suffered to ride before they are three years old, as when the contrary is the practice, they never attain so perfect a growth. It is observed by Lawrence, that the above description delineates that barrel-shape, which Bakewell supposed most advantageous for all kinds of animals intended to be fed for slaughter, or even used for labor.

6136. *The criteria of excellence in neat cattle in general* are thus given by John Wilkinson of Linton, near Nottingham, an eminent breeder. (*Remarks on Cattle, &c.* 1820.) "The head ought to be rather long, and muzzle fine; the countenance calm and placid, which indicates a disposition to get fat; the horns fine; the neck light, particularly where it joins the head; the breast wide and projecting well before the legs; the shoulders moderately broad at the top, and the joints well in, and when the animal is in good condition, the chine so full as to leave no hollow behind them; the fore flank well filled up, and the girth behind the shoulders deep; the back straight, wide and flat; the ribs broad, and the space between them and the hips small; the flank full and heavy; the belly well kept in, and not sinking low in the middle, or so formed that a cross section of it would resemble an oval, whose two ends are of the same width, and whose

form approaches to that of a circle, or of an ellipsis, whose eccentricity is not great; the whole forming, not a round or barrel like carcase, as some have expressed it, for this would leave a deficiency both in the upper and lower part of the ribs; the hips globular, wide across, and on a level with the back itself; the hind quarters, that is, from the hips to the extremity of the rump, long and straight; the rump points fat, and coming well up to the tail; the twist wide, and the seam in the middle of it so well filled, that the whole may very nearly form a plane, perpendicular to the line of the back; the lower part of the thigh small; the tail broad and fat towards the top, but the lower part thin; the legs straight, clean, and fine boned; and when the animal is in high condition, the skin of a rich and silky appearance. These appear to be the most material points for the formation of true symmetry in cattle: there are others of a minor consideration, which will readily be suggested by attention and experience."

6137. *The criteria of an ox well adapted to labor* differ from the above only in requiring long and strong legs, and broad hardy feet and hoofs.

6138. *The criteria of a beautiful cow*, according to Wilkinson, may be thus expressed.

She's long in her face, she's fine in her horn,
She'll quickly get fat, without cake or corn,
She's clear in her jaws, and full in her chine,
She's heavy in flank, and wide in her loin.

She's broad in her ribs, and long in her rump,
A straight and flat back, with never a hump;
She's wide in her hips, and calm in her eyes,
She's fine in her shoulders, and thin in her thighs.

She's light in her neck, and small in her tail,
She's wide in her breast, and good at the pail,
She's fine in her bone, and silky of skin,
She's a Grazier's without, and a Butcher's within.

6139. *Culley's marks of a good cow* are these: wide horns, a thin head and neck, dewlap large, full breast, broad back, large deep belly; the udder capacious, but not too fleshy; the milk-veins prominent, and the bag tending far behind; teats long and large, buttocks broad and fleshy, tail long and pliable, legs proportionable to the size of the carcase, and the joints short. To these outward marks may be added a gentle disposition, a temper free from any vicious tricks, and perfectly manageable on every occasion. On the other hand, a cow with a thick head and a short neck, prominent back-bone, slender chest, belly tucked up, small udder or a fleshy bag, short teats, and thin buttocks, is to be avoided as totally unfit for the purposes either of the dairy-man, the suckler, or the grazier. The most valuable cows are those which are bred in Yorkshire, Staffordshire, and upon the strong lands in other parts of England, and in Ayrshire in Scotland.

6140. *The criteria of excellence in cattle as derived from color*, is of no importance, and all that can be said is, that white and red cattle are less hardy than the black haired.

6141. *The criteria of age in cattle* is derived from the teeth and horns. At the end of about ten years they shed their first four teeth, which are replaced by others, larger, but not so white; and before five years all the incisive teeth are renewed. These teeth are at first equal, long, and pretty white; but as the animals advance in years, they wear down, become unequal, and black. These animals likewise shed their horns at the end of three years; and they are replaced by other horns, which, like the second teeth, continue. The manner of the growth of these horns is not uniform, nor the shooting of them equal. The first year, that is, the fourth year of the animal's age, two small pointed horns make their appearance, neatly formed, smooth, and towards the head terminated by a kind of button. The following year this button moves from the head, being impelled by a horny cylinder, which lengthening in the same manner, is also terminated by another button, and so on: for the horns continue growing as long as the animal lives. These buttons become annular joints or rings, which are easily distinguished in the horn, and by which the age of the creature may be easily known; counting three years for the point of the horn, and one for each of the joints or rings. The cow continues useful for more than twenty years, but the bull loses his vigor much sooner. It is common with dealers to obliterate these rings, by shaving the horns, in order to conceal the age of the beast.

6142. *The terms applied to different ages* are as follow. A young castrated male, after the first year, is called a stot, stirk, or steer; at five years old an ox. A female, after the first year, is called an heifer, or quey; at five years old, a cow. And afterwards, a castrated female is called a spayed heifer or cow. Certain of the Welsh and Scots cattle, of rather a coarse and sturdy kind, are denominated runts. Bullock is the general term for any full-grown cattle, male or female, fat or lean.

6143. *The natural duration of life with the bull and cow* may be stated at upwards of twenty years, to nearly the end of which the latter is useful with her milk, but the former usually loses his vigor, consequently his use, many years sooner.

SUBJECT. 3. *Of the Breeding of Horned Cattle.*

6144. *The objects to be kept in view in breeding cattle, are a form, either well adapted to fatten; well adapted for producing milk; or for labor. These three objects have each of them engaged the attention of British agriculturists; but experience has not hitherto justified the expectation that has been entertained of combining all these desirable properties, in an eminent degree, in the same race. That form which indicates the property of yielding the most milk, differs materially from that which we know from experience to be combined with early maturity and the most valuable carcase; and the breeds which are understood to give the greatest weight of meat for the food they consume, and to contain the least proportion of offal, are not those which possess, in the highest degree, the strength and activity required in beasts of labor.*

6145. *A disposition to fatten, and a tendency to yield a large quantity of milk, cannot be united. The form of the animal most remarkable for the first, is very different from that of the other; in place of being flat in the sides, and big in the belly, as all great milkers are, it is high-sided and light-bellied: in a word, the body of the animal well adapted to fatten is barrel-formed, while that of the milker is widest downwards. It is not probable, therefore, that the properties of two breeds of cattle, so opposite in form and general appearance, can ever be united in the same animal.*

6146. *The long and short horned breeds have hitherto been in possession of the best part of the island; but various others, as the Ayrshire, the Galloway cattle, and Kyloes, might be bred with advantage in many situations, so as to be more profitable than either the short-horns or the long-horns. These breeds of cattle, as true quick feeders, and being kindly-fleshed, or excellent eating beef, have established their character in the first market in the island. The Scotch or Kyloes are better adapted to cold, exposed, heathy, mountainous situations, than any other breed we have. Particular breeds are probably best adapted to particular situations; on which ground breeders of cattle should endeavor to find out what breed is the most profitable and best suited to their situations, and to improve that breed to the utmost, rather than to try to unite the particular qualities of two or more distinct breeds by crossing. The latter is a precarious practice, for we generally find the produce inherit the coarseness of both breeds, and rarely attain the good properties which the pure distinct breeds individually possess. In order to have good cattle of any breed, particular regard must be paid in selecting those that are the most complete and perfect in their form, shape, and other qualities, and to breed from them.*

6147. *An extraordinary degree of attention has been paid to the breeding of cattle in England since the time of Bakewell, and some illustrious names might be mentioned in addition to those of professional farmers. Pedigrees of the best cattle have been preserved with no less care, in several places, than those of race-horses, and in the selection of breeders, the properties of the family from which they have descended, are matters of scarcely less importance than the form of the young animals themselves. The extraordinary prices paid for the best bred bulls and cows, show that this attention has not been without its reward.*

6148. *The best bulls are either let out for the season, or cows are brought to them at a certain rate per head. The practice of letting bulls is said to have originated with Bakewell (Marshall's Midland Counties, vol. I. p. 334.), who, so far back as 1732, let a bull for one hundred and fifty-two guineas, to be used only four months (Parkinson, vol. II. p. 469.); and five guineas per cow were about that time commonly paid to him and other eminent breeders.*

6149. *The age at which bulls should begin to be employed, and the number of seasons they should be allowed to serve, as well as the age at which the females should begin to breed, are points regarding which practice is by no means uniform. In the midland counties, the bulls are pretty commonly allowed to leap while yearlings, and if good stock-getters are kept on as long as they will do business, perhaps till they are ten or twelve years old. In other places they are employed only three seasons, for the first time at two years old. The females, in many instances, bring their first calf at the age of two years, but more commonly, perhaps, not till they are a year older; and in some of the Highland districts, where, owing to a want of proper nourishment in their infancy, they are later in coming to their full growth, the females do not often become mothers till they are about four years old.*

6150. *The period of gestation with cows has been found, upon an average of a great number of experiments, to be about forty weeks. M. Tessier communicated to the National Institute of France the following observations on this subject: Of 160 cows 14 calved from the 241st to the 266th day; three on the 270th; 50 on the 280th; 68 on from the 280th to the 290th; 20 on the 300th, and five on the 308th. Cows seldom bring more than one calf at a time. When they produce twins, one of them a male and the other a female, the latter, which is called a free martin, is commonly considered to be incapable of procreation. Yet there seems to have been well authenticated instances to the contrary. (Farmer's Magazine, vol. vii. p. 462.; and vol. viii. p. 466.)*

6151. *The most desirable period for putting cows to the bull is midsummer, in order that they may be dropped in spring, and have the whole of the grass season before them. Where no regular system is followed, and cows are sent to the bull merely because they are in heat, calves will be dropped at all seasons;*

but excepting in those districts where the fattening of calves is an object of importance, it is probably the most advantageous time; as the calves, having all the grass season before them, become sufficiently strong for enduring the change to a less agreeable food in the ensuing winter. A calf newly weaned seldom thrives well during that period, unless it is pampered with better food than usually falls to the share of young animals. By midsummer the cows are readier to take the bull than at any other season, and will bring calves in proper time. If a cow goes till after May before she calves, the calf will be too weak the winter following; the dam will not be so ready to take the bull again, but will often grow barren.

SUBSECT. 4. *Of Rearing Horned Cattle.*

6152. *The mode of rearing calves is various.* There can be little doubt but that the best and most natural mode is that of allowing them to suck their dams, at least for some length of time after they are brought forth. The usual method in Yorkshire, and most parts of Scotland, is that of giving them milk to drink, there being few instances where they are allowed to suck. For the first two or three weeks they mostly get milk warm from the cow; but for the next two or three weeks, half the new-milk is withdrawn, and skimmed milk substituted in its stead: and at the end of that period, the new-milk is wholly withdrawn; they are then fed on skimmed milk alone, or sometimes mixed with water, till they are able to support themselves by eating grass, or other food of that sort.

6153. *In Cheshire*, the practice is to allow the calves to suck for the first three weeks. They are then fed on warm new whey, or scalded whey and butter-milk mixed; with the green whey, water is frequently mixed, and either oat-meal, or wheat and bean flour added. A quart of meal or flour is thought sufficient to mix with forty or fifty quarts of liquid. Oat-meal gruel and butter-milk, with an addition of skimmed milk, are also used for the same purpose. Some one of these prepared kinds of food is given night and morning for a few weeks after the calves are put on that diet, but afterwards only once a-day, till they are three months old or more.

6154. *The calves in Gloucestershire* are not allowed to suck above two or three days; they are then fed on skimmed milk, which is previously heated over the fire. When they arrive at such an age as to be able to eat a little, they are allowed split beans or oats, and cut hay, and water is mixed with the milk.

6155. *In Sussex* it is common to allow the calves, either to suck for ten or twelve weeks, or to wean them at the end of three or four, and to give them a liberal allowance of skimmed milk for six or eight weeks longer.

6156. *In Middlesex* the methods pursued for rearing calves, are either by giving them a pailful, containing about a gallon, of milk, warm from the teat of the cow, morning and evening, for eight or ten weeks; or, which is certainly the most agreeable to nature, and, therefore, to be preferred to any other that can be adopted, to allow the calf to suck its dam, as is sometimes done in the county of Sussex, and generally in Wiltshire.

6157. *According to Marshal* the best method is this: The calves suck a week or a fortnight, according to their strength (a good rule); new milk in the pail, a few meals; next, new milk and skim-milk mixed, a few meals more; then, skim-milk alone; or porridge, made with milk, water, ground oats, &c., and sometimes oil-cake, until cheese-making commences; after which, whey porridge, or sweet whey, in the field; being careful to house them in the night, until warm weather be confirmed. (*Midland Counties*, vol. I. p. 338.) This method of suckling is not, however, free from objection, and, in the ordinary practice of rearing calves, it is held to be a preferable plan to begin at once to learn them to drink from a pail. The calf that is fed from the teat must depend upon the milk of its dam, however scanty or irregular it may be; whereas, when fed from a dish, the quantity can be regulated according to its age; and various substitutes may be resorted to, by which a great part of the milk is saved for other purposes, or a greater number of calves reared upon the same quantity. (*General Report of Scotland*, vol. iii. p. 51.) Yet it would seem to be a good practice to allow calves to suck for a few days at first, if there was no inconvenience to be apprehended both to themselves and their dams, from the separation afterwards.

6158. *When fed from the pail*, the average allowance to a calf is about two English wine gallons of milk daily, for twelve or thirteen weeks; at first fresh milk as it is drawn from the cow, and afterwards skim-milk. But after it is three or four weeks old, a great variety of substitutes for milk are used in different places, of which linseed oil-cake, meal, and turnips, are the most common.

6159. *Where calves are reared with skim-milk*, it should be boiled, and suffered to stand until it cools to the temperature of that first given by the cow, or a trifling degree more warm, and in that state be given to the calf. Milk is frequently given to calves warm only; but that method will not succeed so well as boiling it. If the milk be given over-cold, it will cause the calf to skit or purge. When this is the case, put two or three spoonfuls of rennet in the milk, and it will soon stop the looseness. If, on the contrary, the calf is bound, bacon-broth is a very good and safe thing to put into the milk. One gallon of milk per day will keep a calf well till it be thirteen weeks old. A calf may then be supported without milk, by giving it hay, and a little wheat-bran, once a-day, with about a pint of oats. The oats will be found of great service as soon as the calf is capable of eating them. The bran and oats should be given about mid-day: the milk in portions, at eight o'clock in the morning, and four in the afternoon. But whatever hours are chosen to set apart for feeding the calf, it is best to adhere to the particular times, as regularity is of more consequence than many people think. If the calf goes but an hour or two beyond his usual time of feeding, he will find himself uneasy, and pine for food. It is always to be understood, that calves reared in this manner are to be enticed to eat hay as early as possible; and the best way of doing this is to give them the sweetest hay that can be got, and but little at a time. Turnips or potatoes are very good food, as soon as they can eat them; and they are best cut small, and mixed with the hay, oats, bran, and such articles. It may be observed, that it is not absolutely necessary to give milk to calves after they are one month old; and to wean them gradually, two quarts of milk, with the addition of linseed boiled in water to make a gruel, and given together, will answer the purpose, until, by diminishing the milk gradually, the calf will soon do entirely without. Hay-tea will answer the purpose, with the like addition of two quarts of milk; but is not so nutritious as linseed. It is a good method of making this, to put such a proportion of hay as will be necessary into a tub, then to pour on a sufficient quantity of boiling water, covering up the vessel, and letting the water remain long enough to extract the virtues of the hay. When bacon or pork is boiled, it is a good way to preserve the liquor or broth, and mix it with milk for the calves.

6160. *In summer*, calves may sometimes be reared on whey only; but when reared in winter, they must be fed with hay; and clover-hay is probably the best of any for this use. Calves may also be raised with porridge of different kinds, without any mixture of milk. It is sometimes a good and convenient plan, the author of the *New Farmer's Calendar* says, to bring up calves under a step-mother; an old cow, with a tolerable stock of milk, will suckle two calves, or more, either turned off with her, or at home, keeping them in good condition, until they are old enough to shift: they ought to suck the first of their mother's milk, for two or three days, although many are weaned without ever being suffered to suck at all. Calves, whether rearing or fattening, should also always suck before milking, the cow being milked

afterwards, as the first and thinnest of the milk is sufficiently rich. Old milk will, perhaps, scour a very young calf; but the effect will go off without any ill consequences. He observes, that the Duke of Northumberland's recipe is to take one gallon of skimmed milk, and to about a pint of it add half an ounce of common treacle, stirring it until it is well mixed; then to take one ounce of linseed oil-cake, finely pulverised, and with the hand let it fall gradually, in very small quantities, into the milk, stirring it, in the mean time, with a spoon or ladle, until it be thoroughly incorporated; then let the mixture be put into the other part of the milk, and the whole be made nearly as warm as new milk, when it is first taken from the cow; and in that state it is fit for use. The quantity of oil-cake powder may, from time to time, be increased as occasion may require, and as the calf becomes inured to the flavor of it. And Crook's method is to make a jelly of one quart of linseed, boiled ten minutes in six quarts of water, which jelly is afterwards mixed with a small quantity of the best hay-tea; on this he rears many calves without milk; thinks many calves are annually lost by artificial rearing, and more brought up with poor and weak constitutions.

6161. *When calves are dropped during the grass season*, Donaldson observes, they should be put into some small home-close of sweet rich pasture, after that they are eight or ten days old, not only for the sake of exercise, but also that they may the sooner take to the eating of grass. When they happen to be dropped during winter, or before the return of the grass-season, a little short soft hay or straw, or sliced turnips, should be laid in the trough or stall before them.

6164. *Castration is performed both on male and female calves*, when neither are intended for procreation. On cow calves, however, it is often omitted. But in Norfolk no distinction is made as to sex; males and females are equally objects of rearing, and are both occasionally subject to castration, it being a prevailing custom to spay all heifers intended to be fatted at three years old; but such as are intended to be finished at two-years old, are, it is believed, pretty generally left "open;" as are, of course, those intended for the dairy. There are two reasons for this practice: they are prevented from taking the bull too early, and thereby frustrating the main intention; and by this precaution may lie more quietly, and are kept from roving at the time of fattening. This may be one reason why spayed heifers are thought to fatten more kindly at three years old, and to be better fleshed, than open heifers.

6163. *The time of performing the operation of castration in horned cattle*, as in all kinds of live stock, is while the animals are yet very young, and just so strong as to endure this severe operation, without any great danger of its proving fatal. The males, accordingly, are cut commonly when about a month old, and the females at the age of from one to three months; but in Galloway, where more heifers are spayed than perhaps in all the island besides, this is seldom done till they are about a year old.

6164. *The best time for rearing calves* is the spring; but that operation must depend in some degree on the time when the calf was dropped. Such as are weaned during autumn or winter, however, seldom do any good. At the season when the calf is weaned from the teat, it ought to be turned abroad, in the day-time, into a small close or orchard near the yard, where there is a good bite of grass, which may be expected at the time of the year when the weaning-calves are of this age; and, as there will generally be more than one calf weaned in a season, they will each be company for the other, and become in a short time reconciled to their situation. It is to be observed, that this pasture should be at some distance from that whereon the dams are turned, and that there be neither ponds nor ditches, nor any annoyance which might endanger the lives of these youthful animals; and, in order to habituate them still more to their pasture, milk-pottage should be carried to them at each of their feeding hours. For the first month or six weeks, the calves ought every night to be brought out of the meadow, and lodged in the pens; but, after this time, they may be left in the pasture as well in the night-season as in the day; and at this time their food may be lowered by degrees, till it be at length reduced to simple water only; for, when the calves get to the age of twelve or fourteen weeks, they will no longer require the aid of this sustenance, but will be able to satisfy their appetites by grass. Care, however, must be taken throughout the summer that they be frequently shifted from one pasture to another, in order that they may be kept up in good flesh, and enabled to grow away with the utmost celerity. At Michaelmas, or soon after, the calves should be taken into the yard; and if they were allowed the indulgence of a small close to themselves it would be still better.

6165. *The treatment of young cattle*, from the time they are separated from their dams, or able to subsist on the common food of the other stock, must entirely depend upon the circumstances of the farm on which they are reared. In summer, their pasture is often coarse, but abundant; and in winter, all good breeders give them an allowance of succulent food along with their dry fodder. The first winter they have hay and turnips; the following summer coarse pasture; the second winter straw in the fold-yard, and a few turnips once a day, in an adjoining field, just sufficient to prevent the straw from binding them too much; the next summer tolerably good pasture; and the third winter as many turnips as they can eat, and in every respect treated as fattening cattle. (Culley, p. 47.)

6166. *The method of managing young cattle during the first winter* is, according to Donaldson, pretty generally the same in every part of the island. They are almost always housed: sometimes bound up to the stall; but more frequently allowed to remain at freedom. The way of feeding them in England is chiefly with hay, or hay and straw mixed; and in Scotland, sometimes hay, but more frequently straw and turnips. They are mostly turned out on some of the inferior pastures on the farm the following summer, and maintained the second winter on straw in the straw-yard, or in houses or sheds erected for the purpose. Some farmers in the more northern parts of the kingdom, from being situated at a distance from any market at which they can dispose of stall-fed beef, very frequently give a considerable part of their turnip-crop to their young cattle. This is, he thinks, an excellent practice; and one that ought to be followed, even by those who, from being better situated in regard to markets, can adopt other methods of using turnips to advantage. The benefit of green winter food for live-stock is so great, that there is probably, he says, no way in which turnips can be used, by which the farm or the farmer would reap greater benefit, than by giving the young cattle a daily allowance during the first two or three winters.

SUBJECT. 5. *Of Fattening Calves by Suckling.*

6167. *The most advantageous stock for suckling calves* for the butcher, is that sort of cow which gives the greatest quantity of milk, richness of quality being not so great an object, or so well adapted to the desired purpose. The Holderness cows are to be preferred in this view; not, however, to suckle calves of the same, but of a smaller breed: perhaps Devon

calves surpass all others as sucklers, whether for quickness of proof, or beauty of the veal ; they are not, however, to be procured, but in or near their own country.

6168. *The method most commonly employed in fattening calves* is, to allow them to suck ; as by this method the object is probably not only sooner, but more effectually attained than by any other means. The period which is necessary for fattening calves in this way must be different, according to circumstances, but it is generally from seven to nine weeks ; however, in the dairy districts, where milk is considered a valuable article, scarcely half that time is allowed. There is another method, which is, to give them the milk to drink ; and when that is done, it is given them morning and evening warm from the cow, and the quantity increased according to their age and strength. In whatever way they may be managed, they should be kept in pens in a close-house, and well littered. The author of the *Synopsis of Husbandry* observes, that as it is necessary that the calves should lie always quiet, in order that they may indulge in sleep at those times when they are not employed in sucking ; it seems proper that the cow-house should be situated in the most retired part of the yard, and that the pens should be kept as dark as possible. But notwithstanding this caution, the calves should by no means be suffered to lie too hot in the summer-time, which would be apt to produce a sickness amongst them. To admit, therefore, an occasional draught of fresh air, let a window be cut in each pen, with shutters adapted to the same, and let these windows be opened whenever the closeness of the atmosphere indicates it to be necessary. In the summer season, they should rarely, if ever, be closely shut ; and when it is required, the stream of air may be increased by opening the cow-house door at the opposite end of the building. Each calf should have a collar round his neck, with which the attendant may direct him in his suckling, but should never be fastened up in the pen. It is necessary that the pens be kept constantly well littered with the cleanest wheat-straw, a proportion of which should be thrown into them every day ; cleanliness being a most essential article in the fattening of every animal, and not more necessary to any than the calf, which, but for this precaution, would in a short time demonstrate the ill effects of lying on his accumulated dung, which of all other animals is the most offensive, and of a quality highly septic. As the calves are yeaned, they are to be taken into the pens, and suckled on their own dams, which, at first, will yield a far greater quantity of milk than is necessary for their offspring, so that another calf may be suckled thereon ; or the cow may be milked, and the cream be reserved for butter, or applied to any other use that the owner may think proper. As the calf increases in size, it will require a larger quantity of milk : but whilst calves are young, one good cow will yield a noble supply for two ; and when the whole produce is demanded for one calf, another new milch cow should be provided, and these two cows will abundantly supply the three calves with milk till the oldest is fit for the butcher ; after which, if necessary, a fresh suckler may be brought in, and the business be carried on progressively by keeping the house constantly supplied with calves, so that the whole milk may be sucked, as the fattening of calves by suckling and the dairy cannot be conveniently united.

6169. *Young calves, when permitted to suck their fill*, are often seized with a lax or scouring. To prevent which, the calves for the first fortnight or three weeks may be stinted in their allowance ; and at the same time due regard should be taken that they do not pine or decrease in flesh for want of milk. But after this age they should be allowed to suck as long as they choose, and every means ought to be made use of to increase their appetite, and render them more eager after their food. Chalk may be given for this purpose, as well as for giving to the flesh a delicate whiteness. An excellent astringent remedy has been already given. (5883.) Salt sprinkled in the trough will likewise act as a stimulus to the appetite ; besides which, it is a common practice with some people to cram their calves with balls compounded of flour, pounded chalk, and milk, with the addition of a small quantity of common gin. Of these balls they give two, about the size of a walnut, once a-day, or oftener, to each calf. These balls being very nutritious, in some degree supply the place of milk, and at the same time the spirituous mixture operates on the creatures as a soporific, and thus, by composing them to sleep, increases their disposition to fatten : but where milk can be had in sufficient abundance, it is never worth while to have recourse to these factitious aids. When the demands of the calf, however, are beyond the ability of the cow, these balls come seasonably to their relief. In order that the calves may be provided with sufficient store of milk, the pastures should still be changed, whenever the cows are found to be deficient in this particular : and in the winter-time, such food as is of a succulent nature, as grains, turnips, &c. should be always at hand to supply the want of grass : and these, with a due allowance of the sweetest hay, should be their constant aliment during the time that the cows are confined to the yard.

6170. *The prices of suckling calves* vary according to the goodness of the young animal, and the time of year wherein the purchase is made. In general, sucklers fetch the largest price in summer, when veal sells the cheapest ; and the reason of this arises from the smaller number to be met with at that time than

in the spring. When calves are slaughtered at six weeks or two months old, the veal is seldom of a good color; neither has the flesh of these young calves a taste equal to that where the animal has been suffered to live a few weeks longer. To attain both these ends of color and flavor, it is necessary that the calves should be maintained with plenty of milk, and regulated under such management as before directed, till they arrive at the age of eight or ten weeks, according to the season of the year, the more or less kindly state of the calf, the particular demand of the markets, or other eventual circumstances. In the summer season, it may be proper to dispose of them at an earlier period than in the winter; not only on account of their growing away with greater celerity in warm weather, but likewise because of the increased demand for small veal, which is then most saleable. During the last three or four weeks, blood should frequently be drawn from the calf, which will be a likely means towards rendering the veal of a color delicately white; a circumstance so much attended to by the butcher, that he will commonly depreciate such calves, which, from the appearance of their eyes, are likely to die black, as they term it, though in other respects not to be despised.

6171. *Such calves as are suckled on their own dams* will, generally speaking, fatten in a shorter time than those which are afterwards bought in to supply their places. The first obvious reason for this difference in their favor is, their not having been removed from the place where they were first dropped, and having always continued to suck the milk of their parent animal, which must in all reason be supposed of a more nutritious quality to them than that of any other cow. Secondly, the cow having so lately calved, the aliment nourishes and fattens in a higher degree than when the animal becomes stale-milched. Cow-calves are observed to fatten more kindly than the male or bull-calves; and these last are much more coarse-grained, and their flesh less delicate in taste than the former. Calves of the largest size are fattened in Essex, where the business of suckling seems to be better understood, and more properly conducted, than in any other county, and where the farmer keeps the calves to a greater age than in any other part of the kingdom.

6172. *Marshall* is clearly of opinion, that to suckle calves in general after they are ten weeks old is bad management; for his account in this respect is uniform, those of nine or ten having paid as much a week as those of twelve or thirteen; and although a calf of six weeks old may suck nearly as much milk as a calf of twelve weeks old, yet the first month or five weeks the quantity is considerably less, and this advantage of their infancy is doubly as valuable to nine as it is to twelve weeks. There can be no doubt but that the profit of this system of fattening depends materially upon the quickness of return.

6173. *In some districts*, barley-meal, linsed boiled into a kind of jelly, and such-like articles, are given to calves in the course of fattening; but the methods above described are greatly superior, although it must be allowed that they may sometimes be considerably more expensive.

SUBJECT 6. *Of Fattening Horned Cattle.*

6174. *The fattening of cattle demands considerable and constant attention*, and the grand object is to fatten quickly. An animal when in a state of rearing may be considered as a vessel open at both ends, in which the supply and the waste being nearly equal it can never be filled: fattening an animal may be considered as an attempt to fill the vessel, and which can only be done by excess of supply. The waste being the same as before, this excess must be great; if it is not so, the vessel may be rendered fuller than before without ever becoming full. An important hint might be taken from this simile by many farmers, who know little of the difference between feeding and fattening. We have known cattle, sheep, and swine, kept for months and fed, with a view to fattening them, without their gaining a pound of meat.

6175. *The food on which cattle are fatted*, is grass in summer, commonly on pastures, but in a few instances on herbage cut and consumed in feeding-houses or fold-yards; and in winter, by far the greater number are fatted on turnips, along with hay or straw, oil-cake; carrots, potatoes, and other articles of food, are used occasionally, and in particular districts; oil-cake chiefly for feeding the larger animals; but few, comparatively, are fatted on any of these without the addition of turnips, of one or other of the varieties formerly mentioned. (4879.) A considerable number of cattle are also fatted on the offals of distilleries, when distilling from corn; a source of supply, the frequent interruption of which has been much felt in those situations where the soil does not permit the extensive cultivation of turnips. It is seldom or never the practice of the best managers to fatten cattle with roots or other winter food on the field, during that season; but to confine them to houses or fold-yards, where they are well littered, regularly fed, not liable to be disturbed, and sheltered from the inclemency of the weather, and where the manure they make is an object of very considerable importance, and of much greater value than if it were dropped at random over a whole field.

6176. *The age at which cattle are fatted* depends upon the manner in which they have been reared; upon the properties of the breed in regard to a propensity to fatten earlier or later in life; and on the circumstances of their being employed in breeding, in labor, for the dairy, or reared solely for the butcher. In the latter case, the most improved breeds are fit for the shambles when about three years old, and very few of any large breed are kept more than a year longer. As to cows and working oxen, the age of fattening must necessarily be more indefinite: in most instances the latter are put up to feed after working three years, or in the seventh or eighth year of their age. In general, it may be said, that the small breeds of cattle are fattened on pastures, though sometimes

finished off on a few weeks' turnips; and that large cattle, at least in the north, are chiefly fattened in stalls or fold-yards, by means of turnips, and the other articles before mentioned.

6177. *Stall-feeding* is the most common, and, when judiciously conducted, probably the most eligible method, in regard to the cattle themselves, the economy of food, and the expense of farm-buildings. The small shed and fold-yard, called a *hammel* (2657.), are used only for the larger breeds; but they do not seem well calculated for an extensive system of fattening by those who do not breed, but purchase stock every year from different parts. (*Sup. E. Brit. art. Agr.*)

6178. *The two great points in feeding animals, to proof*, according to the author of the *Farmer's Calendar*, are, regularity, and a particular care of the weaker individuals. On this last account there ought ever to be plenty of trough or rack-room, that too many may not feed together; in which very common case the weaker are not only trampled down by the stronger, but they are worried, and become cowed and spiritless, than which there cannot be a more unfavorable state for thrift; beside, these are ever compelled to shift with the worst part of the meat. This domineering spirit is so remarkably prevalent amongst horned cattle, that he has a hundred times observed the master-beasts running from crib to crib, and absolutely neglecting their own provender for the sake of driving the inferior from theirs. This is, much oftener than suspected, the chief reason of that difference so visible in a lot of beasts, after a winter's keep. It is likewise, he says, a very common and very shameful sight, in a dairy of cows, to see several of them gored and wounded in a dozen places, merely from the inattention of the owner, and the neglect of tipping the horns of those that butt. The weaker animals should be drawn and fed apart; and in crib-feeding in the yard, it is a good method to tie up the master-beasts at their meals.

6179. *Fattening cattle*, Donaldson observes, are usually put to grass in May or June, according to the season and situation in regard to climate. The period necessary for fitting an ox for the butcher depends on several circumstances; as the condition he was in when put to grass, the nature of the pasture, and many others; but, in ordinary cases, an ox will be completely fattened in three months. There is, he says, one method of fattening, connected with the grazing system, that the farmers in England are enabled, from the superior excellence of the climate, to adopt with success, which can never be attempted with propriety in Scotland. It is very common, at the close of the grass-season, when the fattening stock happen not to be fully in condition for the butcher, to render them so, by giving them hay two or three times a day in the field, or in hovels erected for the purpose, into which they have access at pleasure.

6180. *When turnips are employed for the purpose of fattening cattle*, especially if they are put up to the stalls in proper condition, which, considering the season of the year (November), must, with ordinary attention, always be the case, from ten to thirteen weeks is fully sufficient to render them fit for market.

6181. *The fattening of cattle with grains* may, in some respects, be considered as a branch of the distillery business; but yet there are some instances wherein those who cultivate farms practise it with a double view — of obtaining a profit on the sale of cattle, and the acquisition of a valuable treasure of useful manure. Adam, the renter of the farm of Mount Nod, near Streatham, in the county of Surrey, erected a very complete building, for the purpose chiefly of fattening cattle on grains. In this building might sometimes be seen several hundred head of cattle.

6182. *The method of fattening cattle with oil-cake, corn, cut chaff, &c.* is practised in many of the English counties, with a degree of success sufficient to warrant farmers in other parts of the island to follow the same practice. The cattle are commonly put up to fatten at the end of the grass season. The usual allowance of oil cake, after it is broken in a large mortar, or, in the fruit districts in a cyder-mill, is about half a peck per day, which is given, one half in the morning, and the other in the evening; to which is added hay, and in some cases ground corn, that is, oats or barley of inferior quality, and cut straw — provincially "chaff." As bullocks fattened in this manner get regularly five, and sometimes six meals a day, it is sufficiently evident that, although it may be upon the whole an expensive mode of fattening, yet it must be both expeditious and effectual.

SUBSECT. 7. *Of the Management of Cows kept for the Dairy.*

6183. *Milch cows* are kept for the manufacture of butter and cheese, for the suckling of calves for the butcher, and for the immediate use of the milk.

6184. *The kind of cow used by the dairymen* who supply the London market, is chiefly the Holderness, a variety of the short-horned breed, with large carcasses and short horns. They are bred chiefly in Yorkshire and Durham; but in part in most counties. The Edinburgh dairies are supplied by short-horned cows from Roxburghshire, and other pastoral districts in the south of Scotland. For private dairies, the variety bred in Ayr-

shire (fig. 648.) have a decided preference as, giving a rich milk and large proportion of butter; and the cheese made from the milk of this breed, known as Dunlop, is decidedly celebrated. In Lancashire, the native long-horned breed, is said in the Report of that county to obtain the general preference. But in Hodgson's dairy at Caton, in the same district, it was found that a short-horned cow, upon an average of twelve months, will yield nine quarts of milk in the day, and four and a half pounds of butter in the week; and a long-horned cow gives eight quarts of milk in the day, and four pounds of butter in the week, for the same period. The cows of both kinds had constantly the same kind of food; but in order to have the clear result, the quantity of food consumed by each cow of the different breeds, should have been fully ascertained. The produce of milk and butter is on the side of the short-horned sort; but it is not ascertained whether the neat balance is in favor of the short or long-horned. (*Lancashire Rep.* 561.) The Guernsey breed is valued by some for the richness of the cream and butter; but both for the dairy and butcher, it is very unprofitable.



6185. *Where butter is the principal object*, such cows should always be chosen as are known to afford the best and largest quantities of milk and cream, of whatever breed they may be. But the quantity of butter to be made from a given number of cows must always depend on a variety of contingent circumstances: such as the size and goodness of the beasts; the kind and quantity of the food; and the distance of time from calving. As to the first, it need scarcely be mentioned that a large cow will give greater store of milk than one of a smaller size; though cows of equal size differ as to the quantity of cream produced from the milk of each: It is, therefore, on those cows whose milk is not only in large abundance, but which, from a peculiar inherent richness, yields a thick cream, that the butter dairy-man is to place his chief dependence; and where a cow is deficient in either of these, she should be parted with, and her place supplied by one more proper for this use. As to the second particular, namely, the kind and quality of the food, those who would wish to profit by a dairy ought to provide for their cows hay of a superior goodness, to be given them in the depth of winter, and this in an unlimited degree, that they may always feed till they are perfectly satisfied. And, when the weather will permit, the cows should be indulged with an outlet to marshes or low meadow-grounds, where they may feed on such green vegetables as are present; which is far preferable to the practice of confining them the whole day on dry meat, will enable them to yield greater plenty of milk, and will give a fine yellow color to the butter even in the winter season.

6186. *In the vales of Buckinghamshire and Oxfordshire*, very great numbers of cows are kept for the purpose of butter. These fertile lands maintain a breed of large cows, which yield great store of milk; so that it is no uncommon circumstance for one farmer to keep a herd of fifty or sixty, and to collect a quantity of cream sufficient to fill a barrel-churn of sixty gallons in a week. The butter made from this cream is sold by the farmer or dairyman, to persons who make it their business to purchase this article at a stated price from Michaelmas to Lady-day, and at an inferior rate from Lady-day to Michaelmas. The butter thus collected is sent to London every week in waggons. It is consigned to the dealers, who retail it to the consumer; and no small profit from this traffic accrues to the waggoner and the butter-merchant. This butter is mostly made up in lumps, containing the quantity of two pounds in each, and for that reason it has obtained the name of lump-butter. Its flavor is peculiarly sweet and agreeable, which is chiefly owing to the goodness of the pasture whereon the cows are fed; for this intrinsic merit would in vain be sought for in butter made from ordinary pastures, how great soever may be the skill of the dairy-woman. And though the grass should be equally luxuriant, the cows of the same breed, and the cream in like abundance, yet would a decided preference still remain in favor of the vale-fed cows; for, as a fattening beast on rich land will thrive much quicker than on thin soils, though the herbage be shorter on the former than on the poor ground, so will cows give a larger store of milk, and that of a more nutritious quality, when fed on deep fertile meadows, than if depastured on those of inferior goodness or quality.

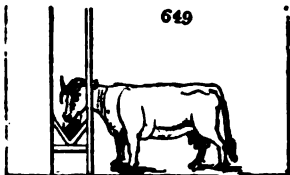
6187. *Epping butter* has long been held in the highest estimation: and great quantities are manufactured in Cambridgeshire and the adjoining counties. The Cambridge butter is sent in small pans; and has an additional quantity of salt mixed with it, to insure its keeping for ten days or a fortnight, and is generally perfectly free from any rancid taste. Yorkshire, Lincolnshire, and other neighboring counties, where the land is rich and fertile, likewise supply large quantities of butter, which is salted and put into tubs for the southern markets.

6188. *Where cheese is the principal object*, the management in respect to the cows must be the same.

6189. *When the object is the suckling of calves*, the farmer should provide himself with a breed of cows suited to the quality of his land. Where the farm abounds with fertile pastures, watered with wholesome streams, and not far distant from the yard, so that the cows may be turned immediately out of the suckling house upon their feed, the benefit will be in every respect superior to what can be expected from an arable farm, or where the green land is in a small proportion to the ploughed. for in this latter case, the cows must depend for their sustenance chiefly on artificial fodder; such as clover, rye-grass, turnips, and other roots and herbage.

6190. *The cow-house* should be of a size adapted to the number of the beasts. Each cow should be driven into the house at suckling-time, and her head confined in a proper manner (fig. 649.), having some fodder lying constantly before her, and a space left between every beast. When they become accustomed to this kind of restraint, they will without any trouble come into the places destined for them, when the calves may be suckled with the greatest ease and facility.

6191. *The time cows should become dry before their calving* is not agreed on, some contending, that they may be milked almost to the time of their dropping the calf without injury; while others maintain, that it is absolutely necessary that they should be laid dry from one to two months, both for the advantage of themselves and their calves. It is probable that much in this business must depend on the manner in which they are kept; as where they are well fed they may be continued in milk till within a week or two of their calving, without suffering any injury whatever from it; but in the contrary circumstances it may be better to let them run dry for a month, six weeks, or more, according to their condition, in order to their more fully recruiting their strength. It appears not improbable, but that the longer the milking is continued, the more free the cows will be from indurations and other affections of the udder; which is a circumstance deserving of attention. Where only one or two cows are kept for the supply of a family, it is likewise useful to know, that by good feeding they may be continued in milk without any bad consequences till nearly the time of calving. In the *Agricultural Survey of the West Riding of Yorkshire* it is stated, that no advantage was found on trial to result from allowing the cows to go dry two months before calving. They have there been kept in milk within ten days of the time of dropping the calf. This practice, however, cannot be considered generally advisable.



6192. *Cows sometimes slip their calves* before they are sufficiently grown. Where this occurs, it is essentially necessary to remove such cows immediately from the cow-yards, or from mixing with the other cattle, for a few days. But where cows are much subject to such accidents, it is the best method to get quit of them as soon as possible, as they will seldom turn out profitable afterwards.

6193. *Cows should be kept constantly in good condition*, as where they are ever suffered to become very lean, and that in the winter season, it is impossible that they can be brought to afford a large quantity of milk, by getting them into perfect condition in the summer months. Where cows are lean at the period of calving, no management afterwards is ever capable of bringing them to afford for that season any thing near the proportion of milk that they would have done if they had been supported in proper condition during the winter. Food of the most nourishing and succulent kinds should therefore be regularly given in suitable proportions in the cold inclement months, and the animals be kept warm, and well supplied with pure water. Some advise their being cleaned by combing and other means; but this is a practice, which, though useful in making them yield their milk more freely, can perhaps seldom be employed on an extensive scale with advantage.

6194. *Where the herd of cows is extensive*, an account should always be kept of the time when each cow takes the bull, that she may be dried off at a reasonable distance of time before the expected term of gestation be completed. The usual time when the cow is dried off is two months before her calving, when she ought to be suffered to lie quiet, and not to be brought up with the other cows at milking or suckling-time. According to some, if a cow be continued in milk nearer to the time of calving than the period above allotted, it will not only greatly injure her future progeny by rendering it weakly and stunted, but will also have an ill effect on her own health: while others, as we have seen (6191.), consider ten days or a fortnight as sufficient. When a cow is four months gone with calf, the fact may easily be ascertained by pressing upon her off-flank, when the calf will be felt to kick against the hand.

6195. *Cows may be known to be near the time of calving*, by springing at the udder or at the bearing. By springing at the udder is meant the collection of liquid in the bag,

which, a few weeks before the time of gestation is accomplished, assumes, in some degree, the appearance of milk, and may be drawn from the teats. To spring at the bearing, is when this part is more than ordinarily large and distended. Heifers are said to spring soonest at bearing, and old cows at the udder. Some cows are peculiarly given to abortions: and where this happens, they should never be continued long in the herd, as being unlikely to yield any considerable degree of profit to the owners of them.

6196. *Cows which are shortly expected to calve*, ought to be lodged at night in a large convenient out-house, or some other place, for a week or two previous to calving, as it may be the means of saving the life of the calf, and perhaps of its dam likewise: for, when a calf drops in the yard or field under such circumstances, the hazard of its perishing through the inclemency of the weather is very great, and it may considerably endanger the life of the cow. But if from inattention, or other causes, the creature should catch cold by calving abroad in sharp winter nights (which may be perceived by a refusal of her food, and by her trembling joints), she ought immediately to be driven into a warm shed, together with her calf, and fed with sugar-sops and ale, and with the best and sweetest hay, and should not be suffered to drink any cold water. By this treatment she will mostly recover in a few days; but should the disorder hang about her, balls composed of aromatic cordial substances may be given.

6197. *A milch cow is in her prime at five years old*, and will generally continue in a good milking state till ten years or upwards; but this depends greatly on the constitution of the animal, some cows, like other animals, exhibiting marks of old age much earlier than others.

6198. *Cows of large size yield great store of milk*, when turned on pastures where the grass is in sufficient abundance, or fed with a constant supply of such food as from its succulency conduces much towards the nutriment of the creature, and enables her to give large quantities of milk, such as turnips, grains, garden-vegetables, &c. But as these large cows require a more ample provision than would fall to their share on the generality of farms, it would seem that they should not be had by those farmers whose land is not of the most fertile kind; for, on ordinary keep, a small cow will yield a fairer profit than one of the Yorkshire or Staffordshire breed, which having been bred on the best kind of land, would be starved where a Scotch or a Welsh cow would find an ample supply of food.

6199. *Those who would make the utmost advantage from cows*, either as calf-sucklers, dairy-men, or milk-sellers, should always provide a bull to run in the herd, to obviate the perpetual trouble of driving them perhaps a mile or more to the bull, and in order to prevent the loss and inconvenience of their becoming frequently barren. One bull will generally be sufficient for twenty cows. These animals are in their prime at two years old, and should never be suffered to continue longer in a state of virility than to the fifth year; as, after that time, bulls which before were gentle and lay quiet in the cow-pastures are mostly apt to contract vicious dispositions, and become very unmanageable. Whenever this happens, they should be immediately castrated.

6200. *For feeding of stalled cows*, the following directions are given to the cow feeder in an improved dairy establishment near Farnham, in Surrey. "Go to the cow stall at 6 o'clock in the morning, winter and summer; give each cow half a bushel of the field beet, carrots, turnips, or potatoes cut; at 7 o'clock, the hour the dairy maid comes to milk them, give each some hay, and let them feed till they are all milked. If any cow refuses hay, give her something she will eat, such as grains, carrots, &c., during the time she is milking, as it is absolutely necessary the cow should feed whilst milking. As soon as the woman has finished milking in the morning, turn the cows into the airing ground, and let there be plenty of fresh water in the troughs; at 9 o'clock give each cow three gallons of a mixture composed of eight gallons of grains and four gallons of bran or pollard; when they have eaten that, put some hay into the cribs; at 12 o'clock give each three gallons of the mixture as before; if any cow looks for more, give her another gallon; on the contrary, if she will not eat what you give her, take it out of the manger, never at one time letting a cow have more than she will eat up clean. Mind and keep your mangers clean, that they do not get sour. At 2 o'clock give each cow half a bushel of carrots, field beet, or turnips; look the turnips, &c., over well before you give them to the cows, as one rotten turnip, &c. will give a bad taste to the milk, and most likely spoil a whole dairy of butter. At 4 o'clock put the cows into the stall to be milked; feed them on hay as you did at milking time in the morning, ever keeping in mind that the cow whilst milking must feed on something. At 6 o'clock give each cow three gallons of the mixture as before. Rack them up at eight o'clock. Twice in a week put into each cow's feed at noon, a quart of malt dust."

6201. *Directions to the dairy maid*. "Go to the cow stall at 7 o'clock; take with you cold water and a sponge, and wash each cow's udder clean before milking; douse the udder well with cold water, winter and summer, as it braces, and repels heats. Keep your hands and arms clean. Milk each cow as dry as you can, morning and evening, and when you have milked each cow, as you suppose, dry, begin again with the cow you first milked, and drip them each; for the principal reason of cows failing in their milk is from negligence in not milking each cow dry, particularly at the time the calf is taken from the

cow. Suffer no one to milk a cow but yourself, and have no gossiping in the stall. Every Saturday night give in an exact account of the quantity of milk each cow has given in the week." (*Farm. Mag.* vol. xv. 314.)

6202. *Harley's dairy establishment at Glasgow* has been celebrated since 1813. The object of the proprietor, who is engaged in various extensive concerns, is to supply the public with new milk free from adulteration, and to have the cow-house, cows, and milk, kept in a more cleanly state than by the usual mode.

6203. *Harley's cow-house* is fitted up upon a new construction. The cattle stand in rows, twelve in a row across the house, head and head, and tail and tail alternately; there is a passage behind for cleaning, and one in front for feeding. In front of each cow is a wire grating, hung like a window sash, which lifts up when giving the soft food and cleaning the cribs, and is put down when they get hay, &c. The contrivances for washing the cribs, collecting the urine, ventilating the house, &c., gives peculiar advantages to the establishment, which may be summed up in the following items: the health of the cattle; the preservation of the timbers; the diminished danger from fire, there being no hay-loft above the cattle; the preservation of the provender; and, the flavor of the milk. The heat is regulated by thermometers. A circulation of air can be produced, so as to keep the cattle comfortable in the hottest weather, by which their health is promoted. The ventilation also prevents the timber from rotting; makes the cows eat their fodder better; as their breath is allowed to escape, instead of being thrown back upon the food, as is the case when their heads are placed opposite a wall. It is well known that milk easily takes a taste from any other substance; of course, if the cow-house is filled with bad air, the milk, while passing from the teat to the pail, and during the time it may stand in the house, will be impregnated with the foul atmosphere.

6204. *In feeding and preparing the food* Harley has made many experiments, and by the mode he now follows, the cattle fatten and milk better, than by the ordinary process; and the milk has no taste from turnips or other vegetables.

6205. *The arrangement for milking*, insures the cows to be clean milked, and also prevents fraud; and the mode of locking up the milk, and at the same time of admitting air, prevents adulteration by the retailer. The cows are not farmed out to milkmen as in London.

6206. *The stock of cows* for some time back, has been 120, averaging eleven English quarts each per day: but both quality and quantity depends much upon the kind of food. Harley gives a decided preference to the Ayrshire breed of cows. They are bought chiefly at country fairs, either newly calved, or a few weeks before calving, and never turned out till they go to the butcher.

6207. *The food of the cows during summer* is cut grass and green barley mixed with old hay; and during winter Harley uses a good many turnips and potatoes, all of which are steamed, and mixed with cut hay and straw; also grains and distillery wash, when these can be got.

6208. *When there is more new milk than supplies the demand*, part is put in the milk-house till next day, when the skimmed milk is sold at half price, and the cream sold at 1s. 6d. per quart. When any cream is left, it is put in a churn and made into butter, once a week or fortnight.

6209. *A table of regulations* has been adopted for the times of feeding, milking, currying the cattle, cleaning the house, &c. Each person has a curry comb and a hair cloth for cleaning the cows twice a day, and a mop and pail for the house, which is washed and sanded twice a day.

6210. *The cleanly state of the cattle and house* make it a treat for visitors to see the establishment; and the way the vessels and milk-house are kept, have made some people fond of milk who formerly were disgusted at it, from the manner in which many town dairies are conducted.

6211. *The advantage of irrigating grass lands with the cow's urine*, almost exceeds belief. Last season some small fields of old grass were cut six times, averaging fifteen inches in length at each cutting, and the sward very thick. The soap-suds of a public washing house are applied to the same purpose with considerable advantage.

6212. *The advantage of this system* to the owner of the cattle is shown by the following abstract, in Harley's own words: but the benefit of a liberal supply of genuine milk to the community at large, particularly to children, it is not easy to estimate

To the general health of the cattle by ventilation		
To the prevention of a disease called grain sickness, when fed on grains		} 15 per cent.
To the prevention of swelling, by eating young and wet grass		
To the prevention of choking, when feeding on turnips or potatoes, &c.		15 do.
To saving in the expense of feeding, by improved modes of cooking, &c.		20 do.
To saving of labor in feeding, dunging, &c. 50 per cent, as one person will do as much as		} 25 do.
two on the old plan; but allow 25 of this for draining, &c., leaves 25 per cent. profit		
on servants' wages		
To saving of timber in the building, as they will last more than double the time.		50 do.

6213. Harley has a steam-engine for driving the following machinery.

A small threshing-mill.	The churning apparatus.
A straw-cutting.	Pumping water, &c.
A turnip and potato slicer.	The same boiler that drives the engine, steams the food, warm water, &c.

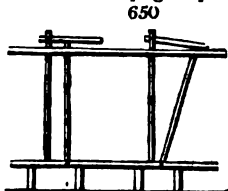
6214. *After much study, labor, and expense*, the establishment is now brought to such a state of perfection, that it receives the cordial approbation of all who have seen it; — furnishing the community with genuine milk at comparatively a low price. It is admitted, that the greater part of the system is original, and is not to be met with in any part of the kingdom. — (*Farm. Mag.*, xv. 189.)

SUBJECT. 8. Of Working Horned Cattle.

6215. *The arguments for and against the working of oxen* have been already stated. (4463.) Though horned cattle are gradually disappearing as beasts of labor, it is probable they will in many places be occasionally used as a substitute for horses, or to get up one or two additional teams on extraordinary occasions. Indeed we see no objections to the occasional use of both oxen and cows for this purpose; more especially in such cases as those of a nobleman's farming; as when breaking up his park, or cutting down and carting away timber, or earth, gravel, &c. to an extent, more than can be readily performed by the ordinary teams of the establishment. For these and such like purposes of amateur farmers; and probably occasionally for some purposes on the farms of rent-paying cultivators, the horned cattle of the farm may afford a valuable resource. For these reasons it seems fitting in this work not to consider the working of oxen as altogether an obsolete practice; and we shall, therefore, notice the training, harnessing, shoeing, age of being put to work, and general treatment of these animals so employed.

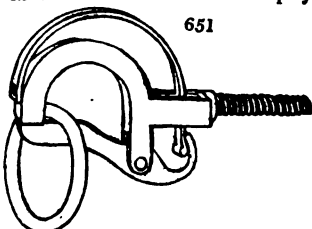
6216. *The training of the calf intended for labor, according to some, should commence at an early period, and after being accustomed to be handled, he should be taught to present his foot to the shoeing smith, as readily as the horse, which is partially the practice in some places. No animal, however, is so easily broke as the ox at any age; and in most countries, where they are used in labor, they are never handled till harnessed and put in the plough, or to drag a tree. This is the case both in Devonshire and Herefordshire, and as they are only worked a few years it does not seem desirable to be at any great expense in their training. The Roman practice, in this particular, may deserve imitation. (99.)*

6217. *Working oxen when kept in a house are generally confined to their places by the same sort of fastening used for cows, (fig. 650.), in which their neck has free play between two upright spars; but in some establishments a ring of a particular description (fig. 651.) is used, to which they are tied by a halter attached to a head strap or bridle. The ring is generally screwed into the front of the manger or eating trough.*



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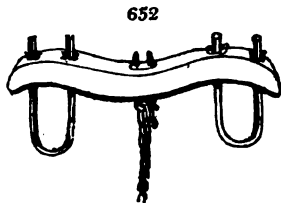
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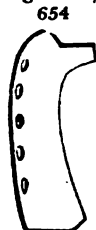
The cattle fastening used in Devonshire is a wooden bow put on their necks and fastened to a round post. The bow consists of two pieces—the yoke, which has two slits terminating in round holes, and the bow, which is made of split ash, and has a knob at each end. These knobs being put through the round holes, the elasticity of the bow forces it along the slit and prevents it returning.

6218. *The most approved kind of harness for the ox is little different from that of the horse, excepting in the shape of the collar. In many places, however, and especially on the continent, the ox draws solely by the withers, by means of what is called a yoke and bow. (fig. 652.)*



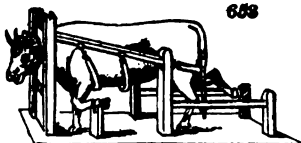
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6219. *The shoeing of oxen is a practice which is yet far from being performed in a perfect manner. Clark says, that in many parts of France, where the ox is used for draught, it is sometimes necessary to employ eight shoes, one under each nail; or four, one under each external nail; and sometimes only two, one under the external nail of each fore foot. In this country two pieces or shoes to each foot are generally made use of, being mostly fixed on, especially in the northern districts, with three or four large headed nails to each shoe. They are fitted on in a similar manner to those of the horse. But, from the shoes of these animals being from the smallness of the pieces so liable to break, it has been suggested to have them shod with whole shoes in the manner of the horse; but how far this practice would answer, must depend upon future trials. As there is much trouble in the shoeing of these animals, from it being necessary to cast them each time, it has been found requisite to have recourse to contrivances for shoeing them standing (fig. 653.)*



654

6220. *An ox shoe (fig. 654.) consists of a flat piece of iron, with five or six stamp holes on the outward edge to receive the nails; at the toe is a projection of some inches, which passing in the cleft of the foot, is bent over the hoof, so as to keep the shoe in its proper place. This projection is not, however, employed in the general practice of making these shoes.*



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6221. *The age at which an ox may be worked is from two and a half to three and a half years. Some begin at two, but it ought to be for very light operations, and such as are not of long duration. The period to which the ox is worked varies from his fifth to the tenth year.*

6222. *Parkinson's father used to make up occasionally an ox team for the plough of four oxen and one horse as a leader, which he found did about two-thirds of the labor of two horses. There are, he says, great objections to ox-teams in the plough. He has, however, found them useful in some sorts of farm-work, from their slow, steady pace; as in scarifying, leading dung, &c., as the work suits them from its being easy, and having a great deal of standing: they are, says he, much cheaper kept than horses, and eat straw in the winter, and are valuable for making dung. He never saw this practice injure their growth. They may be worked from two till five years old, without any loss of time, as they grow to that age, and are then both larger and better beef than three year old steers. He, therefore, recommends ox-teams for leading dung and the other odd jobs, but not to plough and harrow. If they are worked to*

the age of eight or ten years, it is, he thinks, a real injury to the public, and an unprofitable practice to the farmer.

6223. *Bakewell* used to work moderately his heifers whilst carrying their first calves; an unobjectionable practice, provided they be well fed. Bulls are generally allowed to be good laborers, and capable, if high fed, of vast exertions.

6224. *The length of time, per day, which an ox is kept in the yoke, varies according to the kind of labor, and the age and keep of the ox.* If an ox is fed on hay, oats, and some roots, he will plough four days a week; but if on straw and roots only, not above three days. In the former case he is worked two whole days, and two half days, and in the latter case six half days. The latter is the best plan, for which reason, where oxen are regularly worked, two pairs should be kept for each ploughman.

6225. *The most desirable breeds of oxen to work are the Devonshire and Herefordshire varieties, which are long-legged, quick-stepping animals.* Lord Somerville, who has carried the working of oxen to greater perfection than any one else, prefers the Devon breed, which most cultivators consider the quickest walkers in England. When horned cattle are only worked occasionally, whatever sort of animals are on the farm, whether bulls, cows, or oxen, of good or bad breeds, will necessarily be employed.

6226. *The food of horned cattle employed in labor must be substantial.* It is a great mistake to suppose they can work on straw alone. Unless they have roots added to straw in winter, and green food in summer, it will be an idle attempt to harness animals so nourished. The best and indeed the only way is to feed them well with straw, coarse hay, roots, green herbage, or pasturage, as the season and other circumstances may indicate.

SUBJECT 9. *Of the Anatomy and Physiology of the Bull and Cow.*

6227. *The general structure of the bull and cow presents some peculiarities when compared with the horse, whose anatomy having been fully explained, will be taken as the subject of comparison.* The ox, as an animal machine, displays less complexity of structure than the horse; but the principal differences between the two will be found to arise from the evident intention of nature to bound the locomotion of horned cattle; the limbs of the ox are therefore not found favorable to speed; nor does his general mass betray that symmetrical proportion and mechanical composition that would fit it to be acted on to advantage, as regards quick motion, by the powerful muscles he evidently possesses. For strength alone will not produce speed.

6228. *The skeleton of the ox is formed under the above view; and though the number of his bones differs little from that of the horse, the general form differs materially;—the frontal, the occipital, and indeed most of the bones composing the skull are broad and extended, while to the former are appended the horns.* These, as we have seen (1822.), partake of the nature of true bone, placed within a membranous envelopment, of a mixed nature between cuticle and cartilage. The ox has no upper nippers; the grass being cropped into a tuft by means of the tongue, is cut off by the under nippers; whereas in the horse it is nipped off by the approximation of both incisive teeth.

6229. *The vertebrae or neck bones are the same in number and form as in the horse, but from the diminished elevation of the head, and the peculiarity of attachment of the great suspensory ligament, the ox has no cervical crest.* The dorsal vertebrae are thirteen, with spinous processes, or withers less high. The lumbar vertebrae are six, and the sacral four; the coccyx or bones of the tail are indefinite in number, from eighteen to twenty-five. The pelvic bones in the ox are very large, and the rugged outline of the rump in cattle, arises from the great rising of the spine of the ilium, and tuberosity of the ischium: the ribs are thirteen, eight of them true, and five false; and upon the former rest the scapulae, which do not materially differ from those of the horse.

6230. *The fore limb bones are, the arm, and the fore-arm, which, as in the horse, is composed of the radius and ulna, and bears a general resemblance to that of the horse.* The knee is composed of four bones in the first row, and two in the second, which renders that joint inferior to that of the horse in complexity and elasticity: the same holds good with regard to the hock, where the bones entering its composition are also less numerous than in the horse. The canon or shank has no splint bones attached to it, but it is lower, and enlarges into two articular portions corresponding with the metacarpal before, and metatarsal bones behind: thus from the pasterm downwards, the limb is double, and ends in two separate hoofs, which present, individually, a similarity of structure and design to the single hoof of the horse, but less developed; to the posterior part of each, are appended two imperfect phalanges or claws, thus keeping a connection with the digiti.

6231. *The hinder limbs present nothing remarkable, but preserve the same increased simplicity of structure with the fore.*

6232. *The viscera of the chest offer no peculiarities from those of the horse to deserve notice; neither is the economy of the organs concerned, different.*

6233. *The viscera of the belly of the ox have some specialities, the principal of which consist in the digestive organs, which differ in form, structure, and economy, in some essential particulars, from the same system in the horse.*

6234. *The ox has four stomachs, in which formation, the goat, sheep, camel, and deer, participate.* As it is necessary that these animals should collect much herbage for their support; and as it would fatigue and keep them too long in motion to gather and masticate such a quantity at the same time, so a peculiar provision has been made for them, by which, they first hastily collect their food, pass it into a reservoir, and afterwards commence the mastication of it at their leisure.

6235. *The first stomach, rumen, or paunch, is a very large membranous and muscular bag, principally occupying the left side, and extending, when full, from the middle of the ribs to the haunch, into which the unruminated food is received; consequently, it is the over-distention of this which occasions the malady called hoven: it is in this stomach also that the concretions called hair balls are found. It presents numerous processes to assist in the retention of the food.*

6236. *The second stomach, called also reticulum, bonnet, or kingshood, would appear as a globular appendage to the paunch merely, were it not for its peculiarity of structure, which resembles the cells of the honey-comb, and which is well known to the eaters of tripe. The oesophagus, or gullet, enters at the junction of this with the first stomach, and is continued in the form of a muscular ridge, or segmental tube along the line of junction between these two stomachs, and which is from thence continued into the*

many-piles. In the hornless ruminants, the second stomach is exclusively designed as a reservoir for water, and is capable of holding and preserving a vast quantity of it. A little of this water is passed up, as wanted, to be mixed with the dry matters chewed during rumination. In the deserts of Arabia, where water is met with only at long distances, this reservoir is peculiarly advantageous to the camel and dromedary; and the Arabian travellers, when famishing for water, save themselves frequently at the expense of their camels, by killing of which, and taking out this stomach, they find a supply.

6237. *The third stomach* is named after its foliated structure *many-piles*; there are about eighty or ninety of these septa or folds, which are covered with cuticle, in common with the two former stomachs, by which, some resemblance is kept up between the digestive processes of the horse and ruminants. By the comparative insensibility of these stomachs, they can also bear potent medicines, which would be destructive to the carnivore. By this curious extension of surface, the ruminated food is applied and re-applied to the sides of the bag, to be acted upon in its early stage of digestion.

6238. *The fourth stomach*, called also the *red bag*, abomasum foliosum, and ventriculus intestinalis, is about two feet nine inches long in an ox, and resembles the simple digestive stomach of the mammalia. It is in this stomach that the pulsatious mass of the chyme undergoes a more perfect animalization by being mixed with the gastric fluid, which appears to be wholly secreted here, and thus it is that this stomach only produces rennet. The red bag, to increase its secreting surface, has likewise about nine longitudinal plicæ to each side, with an intervening rugose structure.

6239. *Rumination, or chewing the cud*, is the process whereby the ruminant animals collect their food, and with little or no mastication; when such food is perfectly soft and moist, as in grass, they form it into a bolus, and, with little expenditure of saliva, they pass it down the gullet into the paunch, which, when it has become distended with a sufficient quantity, stimulates the animal to seek for rest and quiet, and he commonly lies down. The paunch begins now to exert its extraordinary powers of separating a portion from the contained mass, and to return it into the mouth, where it undergoes a complete mastication; being retained from falling out of the mouth again by the numerous papillæ or roughnesses on the tongue, which are pointed backwards, and also by the ridges of the palate: sufficiently masticated, and mixed with the saliva, it is again passed down the throat, but instead of again entering the first stomach, the muscular gutter forms itself into a tube, and carries it at once into the third stomach, where, having to undergo a further change, it is passed into the red bag, or fourth stomach; to undergo a further solution by means of the gastric fluid, preparatory to its being converted into nutriment under the name of chyle.

6240. *The intestines of the ox* have not their divisions into great and small so well marked as in the horse; yet the tract is very extended, to admit of a perfect separation of all the chylous particles. In the intestines of the horse, it has been shown (5729.) that much of the digestive as well as the operative process goes on; but the chymous mass is more broken down in the stomachs of a cow than by the united forces of the stomachs and intestines of the horse. Grass, containing less organic molecules than grain, requires to be minutely acted on to afford nutriment; and thus the well fed horse, after having been sufficiently nourished, passes off dung containing much of the original principles of his farinaceous food, and which forms excellent manure; while that of the ox is almost wholly decomposed, merely feculent, and unfitted for this purpose.

6241. *The liver of the ox* is large, and presents a gall-bladder, which that of the horse does not. This gall bag is furnished by several hepatic ducts leading into the neck of the gall duct. By the existence of a gall bladder, the bile is evidently more concentrated; but it is difficult to understand why this should be necessary to the ruminants and not to the horse.

6242. *The pancreas of the ox* is of a loose form. The *spleen* is very large, and is placed on the left side of the paunch. The biliary and pancreatic ducts unite together. The principal fold of the *omentum* is very large, and incloses the four stomachs, and part of the intestines. The *renal capsules* are flat and triangular. The kidneys are *lobulated*.

6243. *The organs of generation in the cow* differ but little from those of the mare, and other mammalia. The penis in the bull is more pointed and taper than that of the horse. The vesiculæ seminales are wanting, but have a small ligamentous bridge instead. The prostates are two.

SUBJECT. 10. Of the Diseases of Horned Cattle.

6244. *Cattle are subject to some very dangerous diseases*, but as their life is less artificial, and their structure less complex, they are not liable to the variety of ailments which affect the horse. The general pathology of the horse and ox being little different, the fundamental rules for veterinary practice, and the requisite medicines, when not particularized, will be found in the *Veterinary Pharmacopœia*, already given. (5879.)

6245. *Mild fever, pantas or pantasia.* Cattle sometimes appear affected with heat, redness of the nostrils and eyelids: they refuse food, are dull, evacuate and stale with difficulty; and the urine is high colored. These symptoms are often aggravated every other day, giving it the appearance of an intermittent affection. The complaint is often brought on by over-driving in very hot weather, occasionally by pushing their fattening process too fast. If there be no appearance of malignancy, and the heaving be considerable, bleed, and give half an ounce of nitre in a drink night and morning; but unless the weather be cold do not house the animal.

6246. *Inflammatory fever* is called among farriers, cow-leeches, and graziers, by the various names of black quarter, joint felon, quarter evil, quarter ill, showing of blood, joint murrain, striking-in of the blood, &c. Various causes may bring this on. It is sometimes epidemic, and at others it seems occasioned by a sudden change from low to very full keep. Over-driving has brought it on. No age is exempt from it, but the young offender have it than the mature. Its inflammatory stage continues but a few days, and shows itself by a dull heavy countenance, red eye and eyelids: the nostrils are also red, and a slight mucus flows from them. The pulse is peculiarly quick; the animal is sometimes stupid, at others watchful, particularly at first; and in some instances irritable. The appetite is usually entirely lost at the end of the second day, and the dung and urine either stop altogether, or the one is hard, and the other red. About the third day a critical deposit takes place, which terminates the inflammatory action: and it is to the various parts on which this occurs, that the disease receives its various names. The deposit is, however,

sometimes universal, in the form of a bloody suffusion throughout the whole skin. In others, swellings form on the joints, or on the back or belly; and in fact, no part is exempt from their attack. Sometimes the animal swells generally or partially, and the air being suffused under the skin, crackles to the feel. After any of these appearances have come on, the disease assumes a very malignant type, and is highly contagious.

6247. *Treatment of inflammatory fever.* Before the critical abscesses form, or at the very outset of the disease, bleed liberally, and purge also: give likewise a fever drink (5910.) If, however, the disease be not attended to in this early stage, carefully abstain from bleeding, or even purging: but instead, throw up clysters of warm water and salt to empty the bowels, and in other respects treat as detailed under malignant epidemic. (5767.) It may be added, that four drachms of muriatic acid in three pints of oak bark decoction, given twice a-day, has proved useful. The swellings themselves may be washed with warm vinegar, both before and after they burst.

6248. *Catarrh or influenza in cattle,* also known by the name of *seton*, is only a more mild form of the next disease. Even in this mild form it is sometimes epidemic, or prevalent among numbers; or endemic by being local. Very stormy wet weather, changing frequently, and greatly also in its temperature, are common causes. We have seen it brought on by change of food from good to bad; and from too close pasturage. It first appears by a defluxion from the nose; the nostrils and eyelids are red; the animal heaves, is tucked up in the flanks, and on the third day he loses the cud. There is a distressing and painful cough, and not unfrequently a sore throat also, in which case the beast almost invariably holds down his head. The treatment does not at all differ from that directed under the same disease in horses. (5765.) Bleeding only the first two days, carefully sheltering, but in an open airy place, and littering well up.

6249. *The malignant epidemic influenza* is popularly called the *murrain* or *pest*; and has at various times made terrible havoc among cattle. Ancient history affords ample proof of its long existence; and by the accounts handed down, it does not seem to have varied its types materially. In 1757 it visited Britain, producing extreme fatality among our kine. From 1710 to 1714 it continued to rage on the Continent with unabated fury. (*Lancisi's Disputatio Historica de Bovilla Peste.*) The years 1730 and 1731, and from 1744 to 1746, witnessed its attack, and produced many written descriptions of it, among which stand pre-eminent, that of Sauvages, the celebrated professor of medicine at Montpellier. The British visitation of the malady in 1757, elicited an excellent work from the pen of Dr. Laidlaw, a physician of London, which was afterwards translated into several other languages.

6250. *Symptoms of the murrain.* Dr. Laidlaw describes it as commencing by a difficulty of swallowing, and itching of the ears, shaking of the head, with excessive weakness and staggering gait; which occasioned a continued desire to lie down. A sanious fetid discharge invariably appeared from the nostrils, and eyes also. The cough was frequent and urgent. Fever exacerbating, particularly at night, when it usually produced quickened pulse. There was a constant scouring of green fetid dung after the first two days, which tainted every thing around: even the breath, perspiration, and urine were highly fetid. Little tumors or boils were very commonly felt under the skin, and, if about the seventh or ninth day these eruptions become larger, and boils or buboes appeared with a lessened discharge of feces, they proved critical, and the animal often recovered; but if, on the contrary, the scouring continued, and the breath became cold, and the mouth dark in color, he informs us, mortality followed. Sauvages describes the murrain as shewing itself by trembling, cold shivers, nose excoriated with an acrid discharge from it; purging after the first two days, but previous to which there was often costiveness. Great tenderness about the spine and withers was also a characteristic, with emphysema, or a blowing up of the skin by air discharged underneath it.

6251. *Dissections of those that have died of this disease,* according to Sauvages, have shown marks of great inflammation, and of a great putrid tendency; but the solid parts seldom ran into gangrene. The fluid secretions, however, always were sufficiently dissolved and broken down by putridity. The paunch, he says, was usually filled with undigested matter, and the other stomachs highly inflamed: the gall bladder was also commonly distended, with acrid thick brown bile. Goelich, who likewise dissected these subjects, describes the gall as particularly profuse and intolerably fetid. According to him, the whole alimentary canal, from the mouth to the anus, was excoriated; and Lancisi, contrary to Sauvages, found the viscera of the chest and belly, in some cases, sphacelated and gangrenous. Gazola describes the murrain as accompanied with pustulous sores; and so great was the putrid tendency, that even the milk, before it dried up, which it usually did before the fourth day, became fetid.

6252. *The treatment of the murrain.* In the very early stages, all eminent authors recommend bleeding; but which should not only be confined to the very early periods, as to the first two days; but also to such subjects as by their previous health and condition can bear it. The animals should be placed in an open airy place; the litter should be frequently renewed; and the place itself should be fumigated with the preventive fumigation. (5913.) It has been recommended to burn green boughs with pitch as a substitute: even charcoal fires occasionally carried round the place would be useful. Dr. Laidlaw advised the body to be washed with aromatic herbs in water; but vinegar would have been better. In early stages, saline purgatives, as from ten to twenty ounces of Epsom salts, are to be invariably used. If the scouring have already come on, still, however, purge; but with only half the quantity: an artificial purge will carry off the morbid bile; and if excessive weakness do not come on, the same may be advantageously repeated. Setons are also recommended in the dewlap. When abscesses appear, they may be opened, and their contents discharged, washing the wound with brandy or vinegar, if putrid sloughing takes place. The emphysematous swellings, or cracklings may also be opened, and the air discharged. The other essentials of medical treatment, as detailed under malignant epidemic among horses, is here applicable in every particular. When recovery takes place, it is usually a very slow process, and requires care to prevent other diseases supervening. The animals should continue to be housed, and neither exposed to sun or wind for some time, and the feeding should be nutritious.

6253. *The prevention of the murrain,* or the prevention of its spreading, in many respects is even more important than its medical treatment. Where it has already appeared, all the out-buildings, but particularly the ox-lodges or stalls, should be daily fumigated with the preventive fumigation (5913.); and even the whole of the infected districts should have frequent fires of green wood made in the open air, and every such district should be put under a rigorous quarantine. The cattle on every farm should be carefully examined three or four times every day, and the moment one is found to droop, he should be removed to a distance from the others. In very bad weather, while it is prevalent, the healthy cattle should be housed, and particularly well fed; and their pasture should also be changed. The bodies of those who die of the disease should be buried with their skins on, very deep in the earth, and quick-lime should be strewn over them.

6254. *Phrenzy fever,* or inflammation of the brain, called also *sough*, now and then, but by no means frequently, attacks cattle. The symptoms differ but little from those which attack horses. The treatment must be exactly similar.

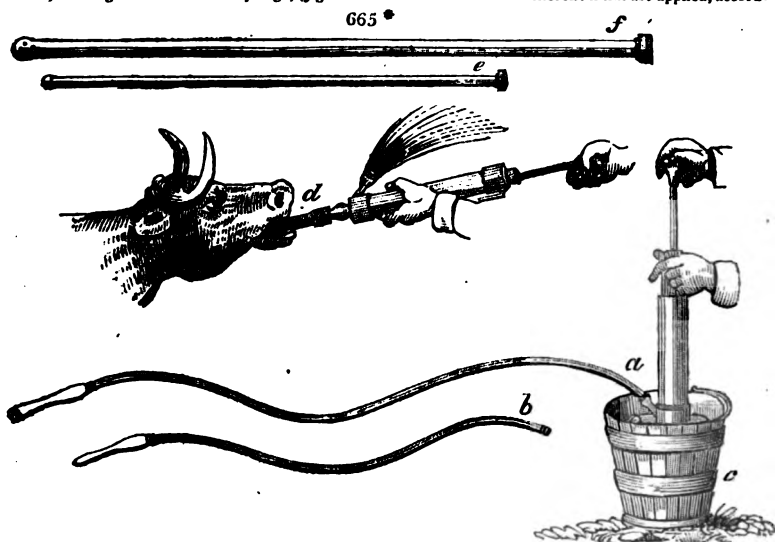
6255. *Inflammation of the lungs* occasionally occurs in cattle, in which also the symptoms, progress, and proper treatment, are similar to those detailed under that head in horse pathology.

6256. *Inflammation of the stomach* sometimes occurs from poisonous matters; and in such cases, when the nature of the poison is discovered, the treatment detailed under poison in horse pathology must be pursued. But there is a species of indigestion, to which cattle are liable in the spring, from eating voraciously of the young sprouts of wood; to which some woods are more conducive than others. The symptoms are heat, thirst, costiveness, lessened urine, quick and hard pulse, with heat and redness in the mouth and nose; the belly is hard and painful, and the stools, when they appear, are covered with glair. When the mouth and nose discharge a serous fluid, the animal usually dies.

6257. *Treatment.* Bleed at first, open the bowels by saline purgatives. (5916.) After this give large quantities of nitrated water, and glister also largely.

6258. *The hicc or blown* in cattle is also an inflammatory affection of the paunch, ending in paralysis and rupture of its substance. From the frequency of its occurrence, it has become a subject of investigation with almost every rational grazier, and a particular matter of inquiry with every agricultural body; from whence it is now very successfully treated by the usual attendants on cattle, when skillful; but when otherwise, it usually proves fatal. It is observed to be more frequent in warm weather, and when the grass is wet. When either oxen, cows, or sheep, meet with any food they are particularly fond of, or of which they have been long deprived, as potatoes, turnips, the different grasses, particularly red clover; they eat greedily, and forget to lie down to ruminate, by which means the first stomach, or paunch, becomes so distended as to be incapable of expelling its contents. From this inflammation follows, and fermentation begins to take place: a large quantity of air is let loose, which still adds to the distention, till the stomach either bursts, or, by its pressure on the diaphragm, the animal is suffocated. The situation of the beast is known by the uneasiness and general swelling of the abdomen; with the circumstances of the animal being found with such food, or the presumption that it has met with it.

6259. *Treatment.* There are three modes of relieving the complaint, which may be adverted to according to the degree of distention, and length of time it has existed. These are internal medicines; the introduction of a *probang* of some kind into the paunch by the throat; and the puncturing it by the sides. Dr. Whyatt, of Edinburgh, is said to have cured eighteen out of twenty hoven cows, by giving a pint of gin to each. Oil, by condensing the air, has been successfully tried. Any other substance, also, that has a strong power of absorbing air, may be advantageously given. Common salt and water, made strongly saline, is a usual country remedy. New milk, with a proportion of tar equal to one-sixth of the milk, is highly spoken of. A strong solution of prepared ammonia in water often brings off a great quantity of air, and relieves the animal. Any of these internal remedies may be made use of when the hoven has recently taken place, and is not in a violent degree. But when otherwise, the introduction of an instrument is proper, and is now very generally resorted to. The one principally in use is a species of probang, invented by Dr. Monro, of Edinburgh. Another, consisting of a cane of six feet in length, and of considerable diameter, having a bulbous knob of wood, has been invented by Eager, which is a more simple machine, but hardly so efficacious. It is probable that, in cases of emergency, even the larger end of a common cart-whip, dexterously used, might answer the end. But by far the best instrument for relieving hoven cattle, as well as for clystering them, is Read's enema apparatus, which is alike applicable to horses, cattle, and dogs. It consists of a syringe, (Fig. 665. * a.) to which tubes of different kinds are applied, accord-



ing to the purpose, and the kind of animal to be operated upon. There is a long flexible tube or giving an enema to horses and cattle, (a), and a smaller one for dogs (b). To relieve hoven bullocks effectually, it is necessary not only to free the stomach from an accumulation of gas, but from the fermenting putrescent mixture which generates it; for this purpose a tube (f) is applied to the extremity of the syringe, and then passed into the animal's stomach through the mouth (d), and being put in action, the offending matter is discharged by a side opening. When the same operation is performed on sheep, a smaller tube (e), is made use of. The characteristic excellency of Read's instrument is, that there is no limit to the quantity of fluid that may not be injected or extracted. The same syringe is used for extracting poison from the stomach of man, for smoking insects, extinguishing fires, and syringing fruit trees. (*Encyc. of Gard.* 1419.) The introduction of any of these instruments may be effected by the help of an assistant, who should hold the horn of the animal by one hand, and the dividing cartilage of the nose with the other; while the operator himself, taking the tongue in his left hand, employs his right in skillfully and carefully introducing the instrument; the assistant bringing the head and neck into such an attitude as to make the passage nearly straight, which will greatly facilitate the operation. But when no instruments can be procured, or as cases may occur when indeed it is not advisable to try them, as when the disease has existed a considerable time, or the animal has become outrageous, or the stomach so much distended with air, that there is danger of immediate suffocation or bursting; in these instances the puncture of the maw must be instantly performed, which is called *pouaching*. This may be done with the greatest ease, midway between the llium, or haunch-bone, and the last rib of the left side, to which the paunch inclines: a sharp penknife is frequently used; and persons in veterinary practice should always keep a long trochar, which will be found much the most efficacious, and by far the most safe, as it permits the air escaping certainly and quickly, at the same time that it prevents its entrance into the cavity of the abdomen, which would occasion an equal distention. As soon as the air is perfectly evacuated, and the paunch resumes its office, the trochar may be removed; and, in whatever way it is done, the wound

should be carefully closed with sticking plaster or other adhesive matter. It is necessary to observe, that this operation is so safe, that whenever a medical assistant cannot be obtained, no person should hesitate a moment about doing it himself. After relief has been afforded by means of either the probang or the paunching, a stimulant drink may yet be very properly given, such as half a pint of common gin; or one ounce of spirit of hartshorn in a pint of ale, or two ounces of spirit of turpentine in ale, may any of them be used as an assistant stimulus. When also the cud is again chewed, still some relaxation of the digestive organs may remain; at first, therefore, feed sparingly, and give, for a few mornings, a tonic. (5882. No. 1.)

6260. *Inflammation of the bowels, or red colic*, is by no means unknown in cattle pathology; the symptoms of which do not differ from those common to the horse, and the treatment also is in every respect the same. (5797.)

6261. *Inflammation of the liver, or hot yellows*, sometimes occurs, in which case, in addition to the symptoms detailed under hepatitis in the horse (5810.), there is, from the presence of syctic bile in the ox, a more determined yellowness of the eyelids, mouth, and nostrils; the treatment must be similar. (5810.)

6262. *Inflammation of the kidneys, called red water* by the cow-leeches, is not uncommon among cattle, and is, perhaps, dependent on the lobulated form of these parts in them. The animal, to the other symptoms of fever, adds stiffness behind, and often straddles, but always shrinks on being pinched across the loins, where frequently increased heat is felt; the urine is sometimes scanty, and now and then increased in quantity, but it is always first red, then purple, and afterwards brown or black, when a fatal termination may be prognosticated. The treatment has been fully detailed under nephritis, in the horse pathology (5812.), and which consists in plentiful bleedings, &c., but carefully abstaining from the use of diuretics, as advised by ignorant cow-leeches.

6263. *The black water* is only the aggravated and latter stages of the above.

6264. *Inflammation of the bladder* also now and then occurs, and in no wise differs from the cystitis of the horse in consequences and treatment. (5814.)

6265. *The colics of cattle* arise from different causes: they are subject to a *spasmodic colic*, not unlike that of horses, and which is removed by the same means. (5805.) *Costiveness* also brings on a colic in them, called *clue bound*, *fardel bound*, &c. which often ends in the *red colic*, unless early removed; the treatment of this we have fully detailed. (5807.) Another colic is accompanied with relaxation of bowels.

6266. *Diarrhœa, scouring, or scouring cow*, is common in cattle, and is brought on by exposure to rain, improper change of food, over-driving, and other violences. It is essentially necessary that the animals be taken under cover, kept warm, and dry, and have nutritious food allowed them. The medical treatment has been detailed. (5804.)

6267. *Dysentery, or brassy, bloody ray, and slimy flux*, differs from simple scouring, in a greater degree of fever attending it, and in its being an inflammation of a particular kind, and part of the intestines. It is frequently dependent on a vitiated putrid state of the bile, brought on by over-driving in hot weather, low damp pastures in autumn, &c. The discharge is characterised by its bad smell, and by the mucous stringy patches in it, and also by its heat and smoking when voided: all which are very different from the mere discharge of the aliments in a state of solution in diarrhœa, and which differences should be carefully marked, to distinguish the one from the other: treat as under dysentery in the horse. (5801.)

6268. *Yellows*. When active fever is not present, and yet cattle are very dull, with great yellowness of eyelids, nostrils, &c., it arises from some biliary obstruction, to which oxen and cows are more liable than horses, from their being furnished with a gall bladder; it is a more common complaint in some of the cold provinces on the continent, where they are housed and stall fed all the year round, than it is in England. The treatment is the same as detailed for chronic inflammation of the liver in horses, (5811.) adding in every instance to it, a change of pasturage, and if convenient, into salt marshes, which will alone often effect a cure.

6269. *Loss of the cud*. This enters the list of most cow-leeches' diseases, but is less a disease than a symptom of some other affection; indeed it is evident that any attack sufficient to destroy the appetite, will generally occasion the loss of the cud. It is possible, however, that an occasional local affection, or paralysis of the paunch may occur, particularly when it is distended with unhealthy substances, as acorns, crabs, the tops of some of the woody shrubs, &c. The treatment, in such cases, consists in stimulating the stomach by tonics, as aloes, pepper, and gin mixed: though these, as liquids, may not enter the stomach in common cases, yet in this disease or impaired action of the rumen, they will readily enter there.

6270. *Sluggers, daisy, or turning*, are sometimes the consequences of over-feeding, particularly when from low keeping cattle are suddenly moved to better pasturage. Treat with bleeding and purging.

6271. *Tetanus, or locked jaw*, now and then attacks cattle, in which case it presents the same appearances and requires the same treatment as in horses. (5763.)

6272. *Cattle surgery* is in no respect different from that in practice among horses, the wounds are treated in the same manner. Goring with the horns will sometimes penetrate the cavity of the belly, and let out the intestines: the treatment of which is the same as in the horse. (580d.) Strains, bruises, &c. are also to be treated like those of horses.

6273. *Foul in the foot*. This occasionally comes on of itself, but is more often the effect of accident: cleanse it well, and keep it from dirt:—apply the foot paste. (5916.)

6274. *Worms, or puckeridge*, are tumors on the backs of cattle, occasioned by a dipterous insect which punctures their skin, and deposits its eggs in each puncture, but which is erroneously attributed to the *fearn owl* or goat-sucker (*Caprimulgus europæus*, L.). When the eggs are hatched, and the larvæ or maggots are arrived at their full size, they make their way out, and leave a large hole in the hide, to prevent which the destruction of the egg should be attempted by nipping the tumor, or thrusting in a hot wire.

6275. *Cattle obetetrics* are not very varied; young cows of very full habits have sometimes a superabundant secretion of milk before calving, which produces fever and heat; sometimes, from cold taken; the same will occur after calving also: in either case, give mild dry food, or hay, bathe the udder also with vinegar and water: in some cases, warm fomentations do best. If the fever run high, treat as under fever in horse pathology.

6276. *The process of calving* is usually performed without difficulty; sometimes, however, cross presentations take place, and sometimes a constriction of parts prevents the natural passage of the calf. To act properly on these occasions, great patience is required, and much mildness: many cows have been lost by brutal pulling; we have seen all the men and boys of the farm mustered to pull at a rope affixed about a calf, partly protruded, which, when it was thus brought away, was forced to be killed, and the mother soon died also from the protrusion of parts this brutal force brought with the calf. A steady moderate pull, during the throes of the animal, will assist much; having first directed the attention to the situation of the calf, that the presentation is such as not to obstruct its progress; if it does, the calf must be forced back, and turned or placed aright.

6277. *Whethering, or retention of the after-birth or burden*.—It sometimes happens that this is retained; for which no better remedy has been hitherto discovered than warm clothing and drenching with ale, administered as a forcer.

6278. *The diseases of calves* are principally confined to a species of *convulsions* which now and then attacks them, and which sometimes arises from worms, and at others from cold. When the first cause operates, it is then relieved by giving a mild aloetic purge, or in default of that, a mild dose of oil of turpentine, as half an ounce, night and morning. In the second, wrap up the animal warm, and drench with ale and laudanum a drachm. Calves are also very subject to diarrhœa or scouring, which will readily yield to the usual medicines. (5863.)

SECT. II. Of the Buffalo.—*Bos bubalus*, L. *Bufflo*, Fr.; *Buffalo*, Span.; *Büfflocks*, Ger.; and *Bufile*, Ital.

6279. *The buffalo* is found wild in India, America, and various parts of the globe, and is in some degree domesticated in many countries. He is gregarious, docile, alert, and of surprising strength; his carcase affords excellent beef; and the horns, which are jet black, and of a solid consistence, take a polish of wonderful beauty: they can be converted into fabrics of use and ornament, such as mugs, tumblers, knife-handles, &c. In this way they sometimes apply them; and when ornaments of silver or mother-of-pearl are employed, the contrast with the polished black of the horn is agreeably striking. The boss on the shoulders is, as well as the tongue, extremely rich and delicious, and superior to the best English beef. It is usual to cure the tongues for sale. The buffalo far surpasses the ox in strength. Judging from the extraordinary size of his bones, and the depth and formation of his chest, some consider him twice as strong as the ox, and, as an animal of labor, he is generally preferred in Italy. In this country the ingenious physiologist, Hunter, has caused buffaloes to be trained to work in a cart; at first they were restive, and would even lie down; but afterwards they became steady, and so tractable, that they were driven through the streets of London in the loaded cart as quietly and steadily as in Italy or India.

6280. *The buffalo* is kept in several gentlemen's parks as an object of luxury, and has been trained and worked by Lords Sheffield, Egremont, and some other amateur agriculturists. Many prefer his flesh, and some his milk, to that of the bull family.

6281. *The breeding, rearing, and general treatment* of the buffalo may be the same as those of the bull family.

CHAP. V.

Of the Dairy and its Management.

6282. *The manufacture of butter and cheese* is of necessity carried on where the milk or raw material is at hand. The subject therefore forms a part of farm management, more or less on every farm; and the principal one in dairy farms. In most of those counties where the profit of the cowarises chiefly from the subsequent manufacture of the milk, the whole care and management of the article rests with the housewife, so that the farmer has little else to do but to superintend the depasturing of his cattle; the milking, churning, and in short, the whole internal regulation of the dairy, together with the care of marketing the butter, where the same is made up wholly for home-consumption, falling alone upon the wife. In this department of rural economy, so large a portion of skill, of frugality, cleanliness, industry, and good management, is required in the wife, that without them the farmer may be materially injured. This observation will indeed hold good in many other parts of business which pass through the hands of the mistress in a farm-house; but there is none wherein he may be so greatly assisted, or so materially injured, by the good conduct or want of care in his wife, as in the dairy.

6283. *The operations of the dairy* in all its branches, are still conducted, perhaps more empirically than those of any other department of husbandry, though it would appear that science, chemistry in particular, might be applied to discover the principles, and regulate the practice of the art, with facility and precision. We have heard it admitted, an eminent author observes, even by experienced dairymen, that the quality of their cheeses differs materially in the same season, and without being able to assign a reason. Every one knows how different the cheese of Gloucester is from that of Cheshire, though both are made from fresh milk, the produce of cows of the same breed, or rather, in both counties, of almost every breed, and fed on pastures that do not exhibit any remarkable difference in soil, climate, or herbage. Even in the same district, some of what must appear the most important points are far from being settled in practice. Marshal, in his *Rural Economy of Gloucestershire*, has registered a number of observations on the heat of the dairy-room, and of the milk when the rennet was applied in cheese-making; on the time required for coagulation; and the heat of the whey after; which are curious, only because they prove that no uniform rule is observed in any of these particulars. The same discrepancy is observable in all the subsequent operations till the cheese is removed from the press, and even afterwards in the drying room. One would think the process of salting the cheeses the most simple of all; and yet it is sometimes, as in the west of Scotland, mixed with the curd; in other instances poured into the milk, in a liquid state, before being coagulated; and still more commonly, never applied at all till the cheeses are formed in the press, and then only externally. In treating of the dairy we shall first offer a few remarks on the nature of milk, and the properties of that of different animals; and next consider the dairy house and its furniture, milking, churning, cheese-making, and the different kinds of cheese, butters, creams, and other products of the dairy.

SECT. I. *Of the Chemical Principles of Milk, and the Properties of the Milk of different Animals.*

6284. *The milk used by the human species is obtained from various animals, but chiefly the cow, ass, ewe, goat, mare, and camel; that in most general use in British dairying is the milk of the cow, which in modern times has received great improvement in quantity as well as quality, by ameliorations in the form of milch cows, in their mode of nourishment, and in the management of the dairy. Whatever be the kind of animal from which milk is taken, its external character is that of a white opaque fluid, having a sweetish taste, and a specific gravity somewhat greater than that of water. Newly taken from the animal, and allowed to remain at rest, it separates into two parts; a thick white fluid called cream, which collects on the surface in a thin stratum; and a more dense watery body, which remains below. The quantity and quality of cream, and the time it requires to separate from the milk, vary according to the nature of the milk and the temperature of the atmosphere. Milk which has stood some time after the separation of the cream first becomes acescent, and then coagulates. When the coagulum is pressed gently, a serous fluid is forced out, and the remainder is the caseous part of milk, or pure cheese.*

6285. *Butter, or solidified cream, one of the most valuable products of milk, is obtained artificially by churning; an operation analogous in its effects to shaking or beating, by which the cream separates from the caseous part and serum, in a more solid form than when left to separate spontaneously. It is afterwards rendered still more solid by beating with a wooden spatula.*

6286. *Cheese is obtained by first coagulating the milk, either with, or deprived of, its cream, and then expressing the serum or whey; the consolidated curd so produced forms cheese. The milk may be coagulated in various ways, but that effect is chiefly produced by the use of rennet, which is prepared by digesting the coat of young ruminating animals, especially that of the calf. The rennet is poured into the milk when newly brought from the cow, or the milk is warmed to 90° or 100° for that purpose. The richness of cheese depends on the quantity of cream which the milk may have contained; its quality of keeping to the quantity of salt added; and the degree of pressure used to exclude the whey.*

6287. *Whey expressed from coagulated milk, if boiled, and the whole curd precipitated, becomes transparent and colorless. By slow evaporation it deposits crystals of sugar, with some muriate of potash, muriate of soda, and phosphate of lime. The liquid which remains after the separation of the salts, is converted by cooling into a gelatinous substance. If whey be kept it becomes sour, by the formation of an acid, which is called the lactic acid; and it is to this that the spontaneous coagulation of milk after it remains at rest is owing. Milk may after it is sour be fermented, and it will yield a vinous intoxicating liquor. This is practised by the inhabitants of the most northerly islands of Europe, with butter-milk, and by the Tartars with the milk of the mare. Milk is likewise susceptible of the acetous fermentation.*

6288. *The constituent parts of milk are found to be oil, curd, gelatine, sugar of milk, muriate of soda, muriate of potash, phosphate of lime and sulphur. These substances enter into the milk of all animals, but the proportions vary in different species. The various milks in use as food are thus distinguished.*

6289. *Cow's milk produces a copious, thick, and yellow cream, from which a compact consistent butter is formed; the curd is bulky, and retains much serum, which has a greenish hue, a sweet taste, and contains sugar of milk, and neutral salts. The milk of the buffalo is essentially the same as that of the cow.*

6290. *Ass's milk throws up a cream resembling that of woman's milk; the butter made from it is white, soft, and disposed to be rancid; the curd is similar to that of the woman, but not unctuous; the whey is colorless, and contains less salts, and more sugar, than that of the cow.*

6291. *Ewe's milk throws up as much cream as that of the cow, and of nearly the same color; the butter made from it is yellow and soft; the curd is fat and viscid; the whey is colorless, and contains the smallest quantity of sugar of any milk, and but a small portion of muriate and phosphate of lime.*

6292. *Goat's milk produces abundance of cream, which is thicker and whiter than that from the cow; the butter is white and soft, and equally copious, and so is the curd, which is of a firmer consistence than that of the cow, and retains less whey.*

6293. *Mare's milk produces a very fluid cream, similar in color and consistence to good cow's milk before the cream appears on the surface; the butter made from it has but little consistence, and is readily decomposed. The curd is similar to that obtained from woman's milk, and the whey has little color, and contains a large proportion of saccharine matter, and of saline substances.*

6294. *Camel's milk throws up little cream, which is whitish and thin, and affords an insipid whitish butter; the curd is small in quantity, and contains but little whey, which is colorless and somewhat saccharine.*

6295. *In the use of these milks*, that of the camel is chiefly confined to Africa and China, and that of the mare to Tartary and Siberia. In India the milk of the buffalo is preferred by the natives to that of the domestic cow. The milk of the goat is more generally used in Italy and Spain, than in any other countries in Europe; they are driven into Leghorn, Florence, Madrid, and other towns, in flocks early in the morning, and milked in the streets. The goat will allow herself to be sucked by the young of various other animals, and a foal which has lost its mother, has been suckled by a goat, placed on a barrel to facilitate the operation. As the butter of goat's milk contains a larger proportion of gelatine, and less oil than that of the cow, it is recommended by physicians as nearly equally light as ass's milk; it is the most prolific of all in curd, and forms excellent cheese; but it is an error to suppose that the parmesan (a skim-milk cheese) is made from it. Ewe's milk is gradually wearing out of use, though it makes excellent cheese, and some milking ewes as well as goats might be kept for that purpose, by those who have extensive upland grass-lands. The milk of the ass comes the nearest to that of the woman, and being the lightest of any is much recommended in pulmonary and hepatic affections. Soda water and warm cow's milk is taken as a substitute, and found almost equally light. The milk in universal use, as an article of food in Britain is that of the cow.

6296. *Lactometers* for ascertaining the value of milk, relatively to butter and cheese, will be described among the utensils of the dairy in the succeeding section.

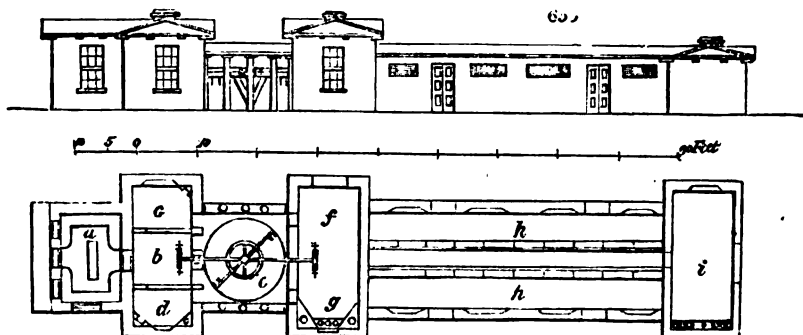
SECT. II. Of the Dairy House, its Furniture, and Utensils.

6297. *The properties requisite in a good milk-house* are, that it be cool in summer and moderately warm in winter, so as to preserve a temperature nearly the same throughout the whole year, or about 45 degrees; and that it be dry, so as to admit of being kept clean and sweet at all times. For these reasons a northern exposure is the best, and this as much under the shade of trees or buildings as possible; if it can be so situated that the sun can have no influence either on the roof or walls, so much the better. A well-constructed butter-dairy should consist of three apartments; a milk-house, a churning-house, with proper boiler, as well as other conveniences for scalding and washing the implements, and a room for keeping them in, and for drying and airing them, when the weather will not permit of its being done without doors. The cheese-dairy should likewise consist of three apartments; a milk-house, a scalding and pressing-house, and a salting-house. To these should be added a cheese-room or loft, which may with great propriety be made above the dairy. This is, however, generally separate from the dairy. But a milk-dairy requires only a good milk-house, and a room for scalding, cleaning, and airing the utensils.

6298. *A dairy for the private use of any farmer or family* need not be large, and may very economically be formed in a thick walled dry cellar, so situated as to have windows on two sides, the north and east in preference, for ventilation; and in order that these windows may the better exclude cold in winter, and heat in summer, they should be fitted with double sashes, and on the outside of the outer sash should be a fixed frame of close wire netting or hair cloth to exclude flies and other insects.

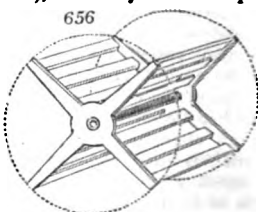
6299. *Of dairies for dairy farmers*, there are different sizes and shapes.

6300. *A dairy-house connected with a cow-house*, and mill for preparing food for the cows, churning, and washing the family linen, is thus arranged. (fig. 655.) The dairy



(a, b, c, d), is at the north end, has hollow walls, double doors, double sashed windows and an ice-house under. The milk room (a), is surrounded by milk coolers, and has a butter-slab and jet in the centre. The jet is supplied from a cistern over the steaming,

house (*f, g*), to which the water is raised from a well by a forcing pump worked by the gin wheel. Besides supplying the jet, it furnishes, by cocks and pipes, water for the usual dairy purposes, the steaming or boiling of food for the cows, their drink, and washing out the cow-house, the washing machine, &c. The churning room (*b*), is separated from the milk-room by double doors, as is the latter from the cheese-room (*c*) and store closet (*d*). The gin wheel (*e*) is worked by one or two horses, or oxen or asses, according to the work to be done. The steaming and washing room (*f, g*) is a large roomy apartment properly fitted up, and furnished with two boilers, a machine for steaming cattle food, another for washing linen by steam; one impelled by the gin wheel operating on an axle with beaters or lifters (*fig. 656.*), and a cylinder of open spars, which turns round in a box of water for washing potatoes or other roots. The cow-house (*h h*) is calculated for forty cows to be fed from a broad passage in the centre. At the south end is a large apartment (*i*) open to the roof for hay, straw, green herbage for soiling, turnips and other food; and under it is an urinarium vaulted, and from which the liquid is drawn by a Buchannan pump (4154.) outside of the building, and some yards distant.

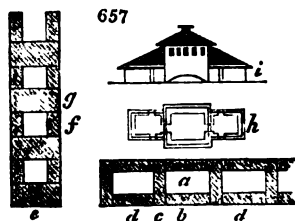


6301. *The dairy-house recommended by Dr. Anderson*, is surrounded by double walls, the inner of brick or stone, nine inches or a foot in thickness; and the outer about two feet distance, built of stone or turf; or a bank of earth faced with turf may be placed against the inner walls.

6302. *The size of the dairy-house* should vary according to that of the number of cows. Marshal found in Gloucestershire one for forty cows to be twenty feet by sixteen, and one for one hundred, thirty by forty. The North-Wiltshire dairy-rooms have in general, he says, outer doors, frequently opening under a pent-house or open lean-to shed; which is a good convenience, affording shade and shelter, and giving a degree of coolness to the dairy-room. In one instance he observed two doors: a common close-boarded door on the inside, and an open-paled gate-like door on the outside; giving a free admission of air in close warm weather, and, at the same time, being a guard against dogs and poultry. A convenience which, he thinks, would be an improvement to any dairy-room in the summer season. The inside wall may be seven or eight feet high in the sides, on which may be placed the couples to support the roof, and the walls at the gables carried up to the height of the couples. Upon these should be laid a roof of reeds, or thatch, that should not be less than three feet in thickness, which should be produced downward till it covers the whole of the walls on each side to the ground: but here, if thatch or reeds be not in such plenty as could be wished, there is no occasion for laying it quite so thick. In the roof, exactly above the middle of the building, should be placed a wooden pipe of a sufficient length to rise a foot above the roof, to serve occasionally as a ventilator. The top of this funnel should be covered, to prevent rain from getting through it, and a valve fitted to it, that by means of a string could be opened or shut at pleasure. A window also should be made upon one side for giving light, to be closed by means of two glazed frames, one on the outside, and the other on the inside. The use of this double sash, as well as the great thickness of the wall, and of the thatch upon the roof, are to render the temperature of this apartment as equal as possible at all seasons of the year, by effectually cutting it off from having any direct communication with the external air.

6303. *The dairy-house made use of by Wakefield of Liverpool*, contains three apartments; a milk-house, churning-room, and room for the utensils. In the milk-house, were the coolers; a slab for laying butter on after it is made up; cocks for drawing off the milk from the coolers; a large cock to throw water on the floor, which slopes a little from that part; cocks at the back part of the coolers, for letting in water; a door, latticed, and another door most commonly used, but pannelled. In the churning-room is a fire-place, a boiler, a large copper, also used when brewing. The room for drying or airing the utensils is also used occasionally as a laundry. Over the whole are apartments for the servants.

6304. *A very neat dairy for a private family* may be made under the shade of two or three tall trees, in the following manner:—Build the walls of bricks, and hollow in Silverlock's manner, by which every course of brick-work is laid on edge, and forms oblong

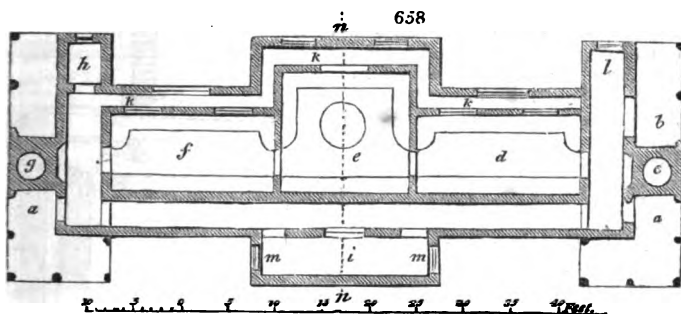


cavities (*fig. 657 a*), the bricks of the one course being laid alternately lengthways (*b*), and cross ways (*c*), and those of the next breaking joint with these, by the cross ones being placed on the middle of the long ones (*d*). The elevation of such a wall (*e, f, g*) should of course be founded on solid work, of breadth and thickness according to the height of the wall, and nature of the foundations. The plan of a dairy with such walls should contain the three usual apartments for milk, churning, and utensils (*h*), and should have double doors and win-

dows: the latter guarded by flywire. The elevation (*i*), may be of any style of simple architecture.

6305. *As a complete dairy on a large scale*, we submit the following. The plan (*fig. 658.*), is of an oblong form, and consists of the three usual principal apartments, enclosed by walls of four inches in thickness, and surrounded by a passage two feet

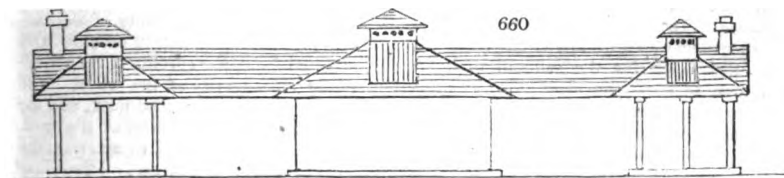
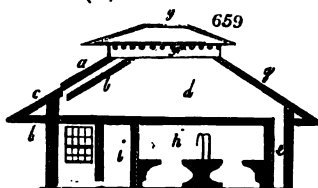
wide to the north, and three feet to the south, which is again surrounded by a nine inch wall. The passages communicate with the roof by covered openings, in the ridge of



which and by the windows, ventilation is completely effected. In detail, the plan exhibits two principal entrance porches (a), back entrance (b), copper for heating water (c), churning-room (d), milk-room (e), utensils and cheese-press (f), boiler for heating milk (g), store closet or butter-room (h), cheese-room (i), passage surrounding the whole (k), water closet (l), and windows to cheese-room (m).

6306. A section (fig. 659.) taken across the milk-room (fig. 658 n n) exhibits the ventilating funnel in the roof (a), projecting eaves (b, c), cheese-room (d), passage on the north side (e), raised part of the roof for ventilation (f, g), fountain in the centre of the dairy (h), and south passage (i).

6307. The elevation (fig. 660.), presents a simple shed roof, varied, however, by projections and recesses: it presents no windows or doors to the south, and, therefore that side, if other circumstances permit, may be covered with vines or other fruit-trees, or with ornamental creepers.

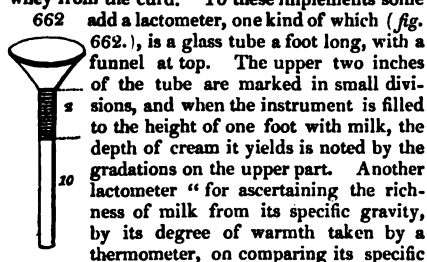


6308. The fixtures of the dairy are, in the scalding room, a copper boiler fixed over a fire-place, for boiling water to wash and scald the utensils; next, some benches and shelves in this room and the cheese-room; and a bench or table not more than two feet wide surrounding the milk-room. It is very desirable, also, that there should be a jet, or fountain, or pump, or spring, in the centre of the milk-room, in order to cool down the air in summer, and to supply clear water at a moderate temperature at all times.

6309. The utensils of the dairy are, pails for milking into; sieves of hair cloth, or silver-wire cloth for passing the milk through, to free it from hairs and other impurities; milk dishes, or coolers, for holding the milk till it throws up its cream; a cream-knife of ivory, for separating, and skimming dishes of willow or ivory for removing the cream; bowls and barrels for holding it, or other preparations of milk-churns, butter-makers, butter-prints; one or more tubs for hot or cold water, in which to immerse vessels that require extraordinary purification; and a portable rack for drying dishes in the open air. All these utensils are requisite where butter only is to be produced.

6310. The utensils requisite, if cheese is to be made, are, the cheese-tub, in which the curd is broken, and prepared for being made into cheese; the cheese-knife, generally a thin spatula of wood, but sometimes of iron, used for the purpose of cutting or breaking down the curd while in the cheese-tub. The cheese-cloth is a piece of thin gauze, like linen cloth, in which the cheese is placed in the press; the cheese-board is circular, and on it the cheeses are placed on the shelves of the cheese-room; their diameter must be somewhat less than that of the interior or hoop part of the vat. The vat is a strong kind of wooden hoop with a bottom, which, as well as the sides, is perforated with holes

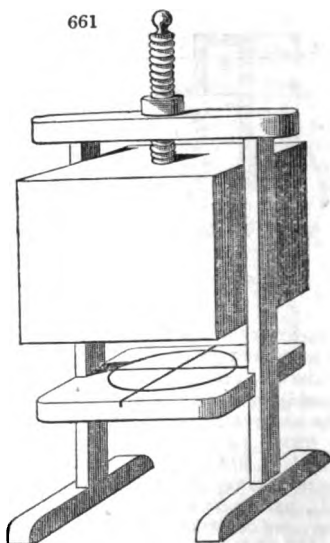
to allow the whey to escape while the cheese is pressing: the size of vats must depend on that of the cheese and the number required, as of most of the other implements on the extent of the dairy. The cheese-press (fig. 661.), is a power generally obtained by a screw, though sometimes by a dead weight, and is used for forcing the whey from the curd while in the vat. The cheese-tongs is a wooden frame, occasionally placed on the cheese-tub, when the vat is set on it in order to drain the whey from the curd. To these implements some



662 add a lactometer, one kind of which (fig. 662.), is a glass tube a foot long, with a funnel at top. The upper two inches of the tube are marked in small divisions, and when the instrument is filled to the height of one foot with milk, the depth of cream it yields is noted by the gradations on the upper part. Another lactometer "for ascertaining the richness of milk from its specific gravity, by its degree of warmth taken by a thermometer, on comparing its specific gravity with its warmth," was invented by Dicus, of Liverpool, but never came into use. Another invention for the same purpose was made by Mrs. Lovi, of Edinburgh, in 1816. It consists of areometric beads, by which the specific gravity of the milk is tried first when new-milked, and next when the cream is removed. When milk is tried as soon as it cools, say to 60°, and again, after it has been thoroughly skimmed, it will be found that the skimmed milk is of considerably greater gravity; and as this increase depends upon the separation of the lighter cream, the amount of the increase, or the difference between the specific gravity of the fresh and skimmed milk, will bear proportion to, and may be employed as a measure of, the relative quantities of the oily matter or butter contained in different milks. The specific gravity of skimmed milk depends both on the quantity of the saccharo-saline matters, and of the curd. To estimate the relative quantities of curd, and by that determine the value of milk for the purpose of yielding cheese, it is only required to curdle the skim-milk, and ascertain the specific gravity of the whey. The whey will, of course, be found of lower specific gravity than the skimmed milk, and the number of degrees of difference affords a measure of the relative quantities of the curd. According to this hypothesis, the areometric beads may be employed to ascertain the qualities of milk, relatively both to the manufacture of butter and cheese. (*Trans. of the High. Soc. sect. v. part i.*)

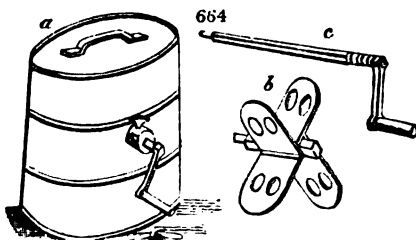
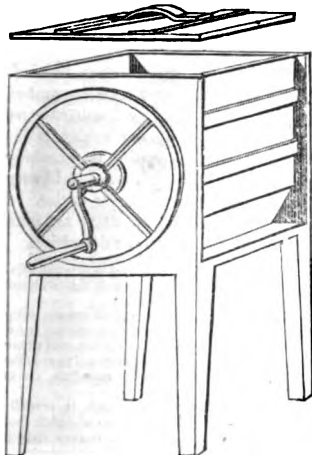
6311. In milk coolers and churns there is considerable variation of form. Milk coolers are generally made of earthen ware or wood; but of late years they have been formed of lead, marble, slate, and cast iron. Their general form is round, and diameter from one to two feet; but in extensive dairies they are often made several feet or yards in length, and from two to three feet wide, with holes at one or more corners to admit the escape of the milk after the cream is removed. The safest dish is wood, though it requires most labor to keep it sweet; next is earthen ware or china, though on the leaden glaze of the former, the acid of the milk is apt to operate. Leaden dishes or troughs, though very general in Cheshire, are the most dangerous; and the objection to slate coolers is the joinings of the plates, which are always unsightly, imperfect, and liable to be operated on by the lactic acid. The annealed and tinned cast iron dishes of Baird's invention (in 1806), and which are now becoming universal in Scotland, are perhaps the best for such as do not chose to go to the expense of China dishes. They are durable from the nature of the material, not liable to be broken by falls from being annealed, easily kept clean from being turned smooth, and also very economical, and said to throw up more cream from a given quantity of milk than any other.

6312. With respect to churns, besides the common *plunge* and *barrel churns*, there are various improved sorts. One of the best for using on a small scale is the patent box churn (fig. 663.); and on a large scale the plunge churn, worked by levers put in motion either by a man or horse. The Derbyshire churn (fig. 664.), which works on the principle of the barrel churn, is an excellent implement on a large scale. The bottom is a segment of a circle, and the advantage of the plan is, that when the butter is made, the lid (a) being removed, the beaters (b) may be taken out at pleasure by with-



drawing the spindle (c) to admit the removal of the butter or the cleaning and scalding of the churn.

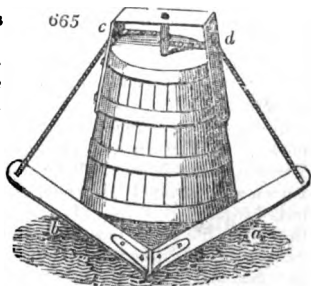
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6313. The Lancashire *plunge churn*, (fig. 665.) is a simple and effective implement, worked by the operator standing on the levers (a, b) throwing his whole weight alternately on each, so as by means of the line (c, d) connected with the churn staff to raise it and turn it round, and lower it and turn it round alternately.

6314. The *most exquisite cleanliness in the dairy*, is an essential requisite, as to the walls, floor, shelves, benches, and in the different utensils. The milk

coolers and all the dishes in which milk is put, as well as the churn, must be scalded, scrubbed, rinsed and dried every time they are used. Scalding is less frequently requisite in the cheese utensils, but they also must be almost daily washed in hot water, dried, and aired. When any vessel becomes tainted with the acidity of milk, it operates like leaven, on what is put into it; if this taint cannot be removed by ordinary scalding, it may by boiling or immersing in water impregnated with alkali; but afterwards it must be well boiled; or a day or two immersed in pure water.



SECT. III. Of Milking and the general Management of Milk.

6315. The *times of milking* vary greatly in different districts. In most places cows are milked twice in twenty-four hours throughout the year; but in the best managed dairies where they are abundantly fed, they are milked at morning, noon, and the approach of night; the additional quantity thus obtained is very considerable, but according to the experiments of Parmentier it must be inferior in quality; for he found twelve hours requisite for the due preparation of the milk in the cow. Where quantity of milk or cheese is an object, three times milking must be decidedly preferable; but it is certain that in the best butter districts of England the cows are only drawn twice a day, between five and six o'clock morning and evening. Whatever may be the times of milking, it is essential that the milk be drawn off clear; for if the milk which the cow can be made to yield at the time be not completely taken away, the quantity left will be reabsorbed into the system, and no more will be generated than is necessary to supply the quantity actually drawn off.

6316. The *operation of milking* is performed by men in many districts, but taking Britain generally it is more commonly the work of women. The milker, whether a man or woman, ought to be mild in manners and good tempered. If the operation be performed harshly, it becomes painful to the cow, who in this case often brings into action her faculty of retaining her milk at pleasure; but if gently performed, it seems rather to give pleasure, as is exemplified on a large scale in Tiviotdale, and Switzerland, where the cows come to be milked at the call of the milkers. Many instances have occurred, Dr. Anderson observes, in which cows would not let down a single drop of milk to one dairy-maid, which let it flow in abundance whenever another approached them; exhibiting unequivocal marks of satisfaction in the one case, and of sullen obstinacy in the other. For the same reason, when cows are ticklish, they should be treated with the most soothing gentleness, and never with harshness or severity; and, when the udder is hard and painful, it should be tenderly fomented with luke-warm water, and stroked gently, by which simple expedient the cow will be brought into

good temper, and will yield her milk without restraint. Lastly, as it sometimes happens that the teats of cows become scratched or wounded, so as to produce foul or corrupted milk, whenever this is the case, such milk ought on no account to be mixed with the sweet milk, but should be given to the pigs, without being carried into the milk-house; lest, by continuing there, it should taint the atmosphere, and consequently prove injurious to the rest of the milk.

6317. To promote cleanliness in regard to milking, cows are in some places curried, combed, brushed, and clothed like horses; before milking, their udders and teats are washed and dried, and their tails trussed up. It would be well if a part of this refinement were adopted in all dairies; that of using the comb and brush, and washing the udder, is indispensable in every establishment where clean milk is an object. According to Moubray snuff-takers, sluts, and daudles, are unfit to be dairy-women, and no milker should ever be suffered to enter the dairy in a dirty apron covered with hairs from the cow-house.

6318. The following aphorisms respecting the management of milk in the dairy are from the "Recreations" of Dr. Anderson, one of the most scientific writers on this subject.

1. Of the milk drawn from any cow at one time, that part which comes off at the first is always thinner, and of a much worse quality for making butter, than that afterwards obtained; and this richness continues to increase progressively to the very last drop that can be drawn from the udder.

2. If milk be put into a dish, and allowed to stand till it throws up cream, the portion of cream rising first to the surface is richer in quality, and greater in quantity, than that which rises in a second equal space of time: and the cream, which rises in the second interval of time, is greater in quantity, and richer in quality, than that which rises in a third equal space of time; that of the third is greater than that of the fourth, and so of the rest; the cream that rises continuing progressively to decrease in quantity, and to decline in quality, so long as any rises to the surface.

3. Thick milk always throws up a much smaller proportion of the cream which it actually contains, than milk that is thinner; but the cream is of a richer quality: and if water be added to that thick milk, it will afford a considerably greater quantity of cream, and consequently more butter than it would have done if allowed to remain pure; but its quality is, at the same time, greatly debased.

4. Milk, which is put into a bucket or other proper vessel, and carried in it to a considerable distance, so as to be much agitated, and in part cooled before it be put into the milk-pans to settle for cream, never throws up so much, or so rich cream, as if the same milk had been put into the milk-pans directly after it was milked.

6319. From these fundamental facts, the reflecting dairyist will derive many important practical rules. Some of these we shall enumerate, and leave the rest to be discovered. Cows should be milked as near the dairy as possible, in order to prevent the necessity of carrying and cooling the milk before it is put into the creaming dishes. Every cow's milk should be kept separate till the peculiar properties of each is so well known as to admit of their being classed, when those that are most nearly allied may be mixed together. When it is intended to make butter of a very fine quality, reject entirely the milk of all those cows which yield cream of a bad quality, and also keep the milk that is first drawn from the cow at each milking entirely separate from that which is last obtained, as the quality of the butter must otherwise be greatly debased, without materially augmenting its quantity. For the same purpose take only the cream that is first separated from the first drawn milk. Butter of the very best quality can only be economically made in those dairies where cheese is also made; because in them, the best part of each cow's milk can be set apart for throwing up cream, the best part of this cream can be taken in order to be made into butter, and the remainder, or all the rest of the milk and cream of the dairy, can be turned into cheese. The spontaneous separation of cream, and the production of butter, are never effected but in consequence of the production of acid in the milk. Hence it is that where the whole milk is set apart for the separation of cream, and the whole of the cream is separated, the milk must necessarily have turned sour before it is made into cheese; and no very excellent cheese can be made from milk which has once attained that state.

SECT. IV. Of Making and Curing Butter.

6320. The milk from which butter is to be made may either be put at once into the churn, and left there till it send up the cream; or it may be made to cream in milk dishes, and the cream alone churned. The last is generally considered the best mode, and in carrying it into effect, the milk being drawn from the cow, is to be strained into the creaming dishes, which should never be more than three inches deep, and of about a gallon and a half or two gallons in capacity. In general the best cream will be fit for removal in seven or eight hours, though for ordinary good butter it may stand twelve hours; but where the very best butter is wished, and such arrangements are formed as admit of converting the milk to cheese, or some other use while it is sweet, it may be separated after standing only two or three or four hours. In performing the operation, first pass the cream knife round the edges of the vessel, to separate the adhering stratum of cream, and then draw it to one side, lift it off with the skimming dish, and put it in the cream bowl to be carried to the cream barrel.

6321. Cream may be kept from three to seven days before it is churned. Where quantity more than quality is desired, the whole of the milk is churned, without separating any cream; the milk is kept in the churn or in large barrels for two or three days, till it begins to get sour. The operation of churning, where the cream and milk are both to agitate, is necessarily tedious and laborious; but a great weight of

butter is undoubtedly obtained, the quality and flavor of which will depend a good deal on the peculiar properties of the milk. The milk of Galloways, Ayrshires and Alderneys, so treated, makes excellent butter.

6322. *In the process of churning great nicety is required ; a regular stroke in plunge or pump churns, and a regular motion in those of the barrel or turning kind, must, if possible, never be deviated from. A few hasty irregular strokes or turns has been known to spoil what would otherwise have been excellent butter. Twamley (Essays on the Dairy) recommends the selection of a churner of a cool phlegmatic temper, of a sedate disposition and character ; and advises never to allow any individuals, especially the young, to touch the churn without the greatest caution and circumspection. To those who have been accustomed to see cream churned without being properly prepared, churning may, perhaps, appear to be severe labor for one person in a large dairy : but nothing is more easy than the process of making butter, where the cream has been duly prepared.*

6323. *The best time for making butter, during summer, is early in the morning, before the sun acquires much power : and if a pump churn be used, it may be plunged a foot deep into a tub of cold water, where it should remain during the whole time of churning ; which will very much harden the butter. During winter, from the equality of temperature, which (if it be properly managed) will generally prevail in a dairy, it will very rarely, if ever, be necessary to churn near the fire. Should any circumstance, however, require this, care should be taken not to churn so near the fire as to heat the wood ; as it would impart a strong rancid taste to the butter. As soon as the butter is made, it must be separated from the milk, and be put into a clean dish ; the inside of which, if of wood, should previously be well rubbed with common salt, to prevent the butter from adhering to it. The butter should then be pressed and worked with a flat wooden ladle or skimming-dish, having a short handle, so as to press out all the milk that may be lodged in the cavities of the mass. A considerable degree of dexterity, as well as of strength, is requisite in this manipulation : for, if the milk be not entirely removed, the butter will infallibly spoil in a short time ; and, if it be much worked, the butter will become tough and gluey, which greatly debases its quality. In some places it is the practice to beat up the butter with two flat pieces of board, which may, perhaps, answer very well. In this operation, some persons pour cold water upon the butter, for the purpose of washing it : this practice, however, is not only useless, for the butter can be perfectly cleared of the milk without it ; but it is also pernicious, and debases the quality of the butter in an astonishing degree. Nothing is so detrimental in a dairy, as water improperly used ; which, if mixed in any way, either with milk or butter, tends greatly to debase the quality of the latter.*

6324. *The making up of butter is the next process. Before being sent to table or market, sweet or fresh butter is made up into various forms, sometimes in rolls or cylinders, six or eight inches long, and from half an inch to two inches in diameter, at other times in small round figures, or casts, with impressions in relief from butter moulds. When the butter is too soft for the last purpose, it may be put into small wooden vessels, which may be allowed to swim in a tub or cistern of cold water ; or they may be set in an ice-house for an hour or two, or the water in which the small vessels float may be iced. At all events, whatever mode is adopted, no water ought to be allowed to touch the butter. When formed into the desired shapes it may be placed in dishes, and set in the margin of the central cistern of water till wanted.*

6325. *In salting or curing butter the use of wooden vessels is preferable. These should previously be rendered as clean and sweet as possible, well rubbed with salt, and the cavity between the bottom and sides filled in with melted butter. An excellent composition for preserving butter may be made, by reducing into a fine powder, and carefully mixing together, sugar and nitre, of each one part, and two parts of the best common salt. Of this composition, one ounce should be thoroughly mixed with every sixteen ounces of butter, as soon as the latter has been freed from the milk ; and the butter must be immediately put into the firkin, being pressed so close, as to leave no air-holes, or any kind of cavities within it. The surface must be smoothed ; and, if a day or two be expected to elapse before more can be added, the vessel must be closely covered up with a piece of clean linen, upon which should be laid a piece of wetted parchment, or (if this be not procurable) with a piece of fine linen dipped in melted butter, that is exactly fitted to the edges of the vessel, all round, so as to exclude the air as much as possible. When more butter is to be added, these coverings are to be removed ; the butter is to be applied close upon the former layer, pressing it down, and smoothing it as before, till the vessel be full. The two covers are then to be spread over it with the greatest care ; and a little melted butter is to be poured all round the edges, so as to fill up every part, and effectually to exclude the air. A little salt may then be strewed over the whole, and the cover be firmly fixed down. Butter thus cured does not taste well till it has stood at least a fortnight after it has been salted ; but after that period, it acquires a rich marrowy taste, and will continue perfectly sweet in this climate for many years. As, however, its quality is liable to be impaired by being improperly treated while it is using, it will be necessary, when the firkin is opened, first to pare off a small portion of the whole surface, especially near the edges, in case the air should, by any accident, not have been entirely excluded. If it is to be quickly consumed, it may be taken up as it is wanted, without any other precaution than that of keeping it carefully covered up ; but, on the contrary, if it is to be used very slowly, and if the person employed to take it up, be not very careful in closing it up each time with the covers, the part which is thus exposed to the air, will be liable to contract a small degree of rancidity. To prevent the occurrence of this inconvenience, when the vessel*

is opened, a strong brine of common salt (strong enough to float an egg) should be poured, when cold, upon the surface of the butter; and although the quality of the latter will be slightly injured by the action of the water upon it, yet that is a much less evil, than the slightest rancidity would occasion.

6326. *When butter is to be exposed to the heat of a warm climate*, it should be purified by melting before it is salted and packed up. For this purpose, let it be put into a proper vessel, and this be immersed into another containing water. Let the water be heated till the butter be thoroughly melted: let it continue in this state for some time, when the impure parts will subside, leaving at the top a perfectly pure transparent oil. This, when it cools, will become opaque, and assume a color nearly resembling that of the original butter, being only somewhat paler, and of a firmer consistence. When this refined butter is become a little stiff, but while it is still somewhat soft, the pure part must be separated from the dregs, and be salted and packed up in the same manner as other butter; it will continue sweet much longer in hot climates, as it retains the salt better than in its original state. It may also be preserved sweet, without salt, by adding to it a certain portion of fine honey, perhaps one ounce to a pound of butter, and mixing them together thoroughly, so that they may be perfectly incorporated. A mixture of this sort has a sweet pleasant taste, and will keep for years without becoming rancid: there is no doubt, therefore, but that butter might thus be preserved in long voyages without spoiling.

6327. *As winter made butter* is mostly pale or white, and, at the same time, of a poorer quality than that made during the summer months, the idea of excellence has been associated with the yellow color: hence various articles have been employed in order to impart this color; those most generally used, and certainly the most wholesome, are the juice of the carrot, and of the flowers of the marigold, carefully expressed and strained through a linen cloth. A small quantity of this juice (and the requisite proportion is soon ascertained by experience) is diluted with a little cream, and this mixture is added to the rest of the cream when put into the churn. So small a quantity of the coloring matter unites with the butter, that it never imparts to it any particular taste.

6328. *The butter most esteemed in London* is that of Epping and Cambridge; the cows which produce the former feed during summer in the shrubby pastures of Epping forest, and the leaves of the trees, and numerous wild plants which there abound are supposed to improve the flavor of the butter. It is brought to market in rolls from one to two feet long, weighing a pound each. The Cambridgeshire butter is produced from the milk of cows that feed one part of the year on chalky uplands, and the other in rich meadows or fens; it is made up into long rolls like the Epping butter, and generally salted, not cured, before brought to market. By washing it, and working the salt out of it, the London cheesemongers often sell it at a high price for fresh Epping butter.

6329. *The Suffolk and Yorkshire butter* is often sold for that of Cambridgeshire, to which it is little inferior. The butter of Somersetshire is thought to equal that of Epping; it is brought to market in dishes, containing half a pound each, out of which, it is taken, washed, and put into different forms by the buttermen of Bath and Bristol. The butter of Gloucestershire and of Oxfordshire is very good; it is made up in half pound packs or prints, packed up in square baskets, and sent to the London market by waggon.

6330. *The butter of the mountains of Wales and Scotland*, and the moors, commons, and heaths of England is of excellent quality, when it is properly managed; and though not equal in quantity, it often is confessedly superior to that produced from the richest meadows. Bad butter is more frequently the result of mismanagement, want of cleanliness, and inattention, than of any other cause. Ireland would produce the finest butter in the empire, were it not for the intolerably filthy state of their cows, and the want of cleanliness in their dairies.

6331. *In packing fresh butter*, or butter salted only for immediate use, the leaves of cabbage, white beet, or of the garden orache (*Atriplex hortensis*) are to be preferred. The bottom of the basket should be bedded with a thick cloth, folded two or three times; then a thin gauze, dipped in cold water, spread over it, on which the prints or rolls of butter are to be placed, each with one or more leaves beneath, and smaller ones over it. The lowermost layer being adjusted, fold half of the gauze cloth over it, put in another layer in the same way, and then cover with the remainder of the gauze. The butter should be put into the basket, as well as taken from thence, without being touched.

6332. *Whey butter*, as its name implies, is butter made from the whey which is taken from the curd, after the milk is coagulated for the manufacture of cheese. It is chiefly made in those counties where cheese is manufactured, and where it forms no inconsiderable part of the profits of the dairy. In the county of Derby, more butter is said to be made from whey than from the cream of milk, or from milk churned altogether.

6333. *Whey is divided into two sorts*, green and white, the former escaping readily from the curd, while the latter is freed from it by means of pressure. "There are different methods of extracting the whey. In some dairies the whole whey, when taken from the cheese tub, is put into pails or other vessels, where it remains for about twenty-four hours; when it is creamed, and the whey is applied to the use of calves and pigs, which are said to thrive as well on it, after the cream has been taken from it as before. The cream, when skimmed off the whey, is put into a brass pan and boiled, and afterwards set in pans or jars, where it remains till a sufficient quantity for a churning be procured, which, in large dairies, happens generally once, but sometimes twice in the week."

6334. *Butter forming an important article of commerce as well as food*, the legislature has passed various statutes respecting its package, weight, and sale. The principal of these are the 36th and 38th of Geo. III.

SECT V. Of the Process of Cheese-making.

6335. *The production of cheese* includes the making of rennet, the selection of a coloring matter, the setting of the curd, and the management of the cheese in the press.

6336. *The milk fresh drawn from the cow is to be immediately strained into the diashes or shallow troughs, if these are used, in order to promote cooling, as the surest guard against fermentation. The same object may be attained by repeatedly drawing off the milk from the coolers, and pouring it back again.*

6337. *To understand what rennet is and its uses it is necessary to premise that milk is no sooner taken into the stomach, than it becomes curdled by the operation of the gastric juice, as every one who has seen much of infant children must have observed. What is called rennet is nothing more than the stomach of an animal in which the gastric juices are preserved by means of salt. The application of any kind of acid will cause milk to coagulate, as well as the infusion of several plants, as ladies' bedstraw (*Galium verum*), butter-wort (*Pinguicula vulgaris*), and others. With the former plant the Jews coagulate the milk for all their cheese; the Mosaic law prohibiting them to mingle meat with milk, and rennet they consider as meat. The maw or stomach of ruminating animals, which admit of obtaining the gastric juice in a less mixed state than those of others, and chiefly of a young calf that has been killed before the digestion is perfected, is almost universally preferred as rennet. This bag or maw is cleaned and salted in different ways in different districts; but the following method described by Marshal in his *Rural Economy of Norfolk*, is considered as one of the best. "Take a calf's bag, maw, or stomach; and having taken out the curd contained therein, wash it clean, and salt it thoroughly inside and out, leaving a white coat of salt over every part of it. Put it into an earthen jar, or other vessel, and let it stand three or four days; in which time it will have formed the salt and its own natural juice into a pickle. Take it out of the jar, and hang it up for two or three days, to let the pickle drain from it. Re-salt it, place it again in a jar, cover it tight down with a paper, pierced with a large pin, and in this state let it remain till wanted for use. In this state it ought to be kept twelve months; it may, however, in case of necessity, be used a few days after it has received a second salting; but it will not be so strong as if kept a longer time."*

6338. *In order to prepare this rennet for use, Marshal gives the following directions; "Take a handful of the leaves of sweet-briar, the same quantity of the leaves of the dog rose, and the like quantity of bramble leaves; boil them in a gallon of water, with three or four handfuls of salt, about a quarter of an hour; strain off the liquor, and, having let it stand till perfectly cool, put it into an earthen vessel, and add to it the maw, prepared as above. To this is added, a good sound lemon, stuck round with about a quarter of an ounce of cloves, which give the rennet an agreeable flavor."*

6339. *The strength of the rennet thus prepared will increase in proportion to the length of time during which the bag remains in the liquor; the quantity to be used for the purpose of coagulating milk can, therefore, be ascertained only by daily use and occupation. In general, however, it may be stated, upon the average, that somewhat less than half a pint of wine measure, will suffice for fifty gallons of milk, for which quantity, in Gloucestershire, the practice is to employ about one third of a pint. Throughout the whole process of preparing and preserving rennet, too much attention cannot be given to its cleanliness and sweetness; for if it be kept too long, so as to become foul or tainted, the cheese will invariably become affected by it, and will prove unfit for use.*

6340. *In Holland a small quantity of the muriatic acid is used instead of rennet; and it is the use of this article which gives to the Dutch cheese that pungent relish, which induces so many persons to prefer it.*

6341. *Coloring matter. As cheese in its native state, that is, such as is well manufactured, being put together in proper time, the milk being of a proper degree of warmth, and in all other respects properly pressed, salted, and dried, is uniformly of a bright yellow cast, the idea of excellence is generally attached to cheese of such a color. Hence it has become necessary for the dairyman, who would dispose of his cheese to advantage, to impart a light yellow orange color to it by artificial means. Formerly, turmeric, marigolds, hawthorn buds, and other vegetables, were employed for this purpose; but these have long since been rejected for the Spanish Arnotto, which is unquestionably the best ingredient of the kind that can be used for the coloring of cheese. It is a preparation of the rowcon or arnotto tree (*Bixa orellana*, Lin. fig. 204.), which is a native of America. The red pulp, that covers the seeds of this tree, is suspended in hot water, and allowed to subside, and when dry, is formed into cakes or balls, which are further set aside, until they become completely dry and firm. One ounce of this substance, when genuine, will be sufficient to color an hundred weight of cheese; and this is the common allowance in the county of Gloucester; in Cheshire, the weight of a guinea and a half, is considered to be sufficient for a cheese of sixty pounds weight. The usual mode of applying the arnotto is, to dip a piece, of the requisite size and weight, in a bowl of milk, and rub it on a smooth stone, until the milk assume a deep red color. This infusion is to be added to the milk, of which cheese is intended to be made, in such a quantity as will impart to the whole a bright orange color, which will*

become the deeper in proportion to the age of the cheese. The mixing of the arnotto in no respect affects either its taste or smell.

6342. *In the county of Cheshire*, however, a somewhat different practice obtains. There, when the coloring matter is wanted, it is usual to tie up as much of the substance as may be deemed sufficient, in a linen rag; and putting it into half a pint of warm water, to let it stand over night. In the morning, immediately before the milk is coagulated, the whole of this infusion is mixed with it in the cheese-tub, and the rag is dipped in the milk, and rubbed on the palm of the hand, until all the coloring matter is completely extracted. A more simple method is directed by Parkinson: "Take," says he, "a piece about the size of a hazel nut, put it into a pint of milk the night before you intend to make cheese, and it will dissolve. Add it to the milk at the time the rennet is put in. The quantity will suffice to color a cheese of twenty pounds weight." (*Parkinson on Live Stock*, vol. i. p. 62.)

6343. *Setting the curd.* The proper season for making cheese is from the beginning of May till the close of September, or, in favorable seasons till the middle of October. Very good cheese, however, may be made in winter, provided the cows be well fed. A certain elevation of temperature is requisite to the coagulation of milk, and it may naturally be supposed to be nearly that of the stomachs of milk-taking animals. Marshal is of opinion that from 85 to 90 degrees of heat, and two hours of time are the fittest for coagulation. Climate, season, weather, and pasture may require that these limits should sometimes be violated. Milk produced from poor alays will require to be coagulated at a higher temperature than that which is procured from rich pastures. In some dairies the milk is heated to the proper temperature; but the most approved practice is to mix boiling water in such a proportion as shall render the milk of a proper degree of heat to receive the rennet; this the thermometer should be used to determine. In hot weather the milk in the cows' udders is liable to become very much agitated by their running about, or being driven to too great a distance: so that if rennet be put to it in this state, the curd, instead of coming in one or two hours, will require three, four, or five hours, and will be so spongy, tough, and in every respect so imperfect, as to be scarcely capable of being confined in the press or vat; and when released from the press, it will heave or split, and be good for little. Whenever therefore cows are discovered to be in this state, which, perhaps, can scarcely be avoided during very hot weather, where cows are pastured abroad, in unsheltered grounds, or where water is not within their reach; it will be advisable to add some cold fresh spring water to the milk as soon as it is brought into the dairy. The quantity to be mixed, in order to impart the proper degree of heat, can in this case only be regulated by experience and the use of the thermometer. The effect of the water thus added, will in both cases be, to make the rennet take effect much sooner, and consequently to accelerate the coagulation of the milk.

6344. *The proportion of rennet and time requisite for coagulation* have been already mentioned (6339. 6343.); too much rennet ought not to be put in, otherwise the cheese will be ready to heave, as well as become rank and strong; the same effects will also be produced if the rennet be made with bad or foul materials, or if it be too strong to operate in the given time (two hours). During the process the milk ought to be covered so as not to lose more than five or seven degrees of its original heat. One or two handfuls of salt added previously to mixing the rennet will promote coagulation. Some put in a bowl, which is an absurd ancient custom, is injurious rather than useful.

6345. *When the coagulation has taken place*, the curd is broken or cut with a cheese knife, which causes the whey to rise through the incisions, and the curd sinks with more ease. After a short time the cutting is repeated, still more freely than before; and is continued until the curd is reduced to small uniform particles. This operation will require about three quarters of an hour: the cheese tub is again covered with a cloth, and is allowed to remain for the same time. When the curd has sunk to the bottom of the vessel, the whey is taken off by the hand, or by means of a skimming-dish; another quarter of an hour should now be allowed for the curd to settle, drain, and become solid, before it is broken into the vat, as it prevents the fat from being squeezed out through the fingers, and of course contributes to improve the quality of the cheese. Sometimes in addition to the skimming-dish, a semicircular board and weight, adapted to the size of the tub, are employed. The curd is again cut as before, in order to promote the free separation of the whey, and pressure is again applied till it be wholly drawn off. Great attention is requisite in conducting this part of the business; and if any particles of slip curd should be seen floating in the whey, it ought to be carefully laded off with the whey; as it will not incorporate with the solid curd, but, dissolving in the cheese, causes whey-springs, as already mentioned, and materially impairs its soundness. If the whey be of a green color, when loaded or pressed out, it is a certain criterion that the curd has been properly formed: but if it be of white color, it is equally certain that the coagulation is imperfect, the cheese will be sweet, and of little value, and much valuable caseous matter will be completely thrown away. In the counties of Norfolk and Suffolk, the cheese manufacturers have recourse to a somewhat different method for extracting the whey, which is worthy of notice: when they think the milk sufficiently coagulated, they lay a strainer in a basket made for the purpose; into which they put the

curd, and suffer it to remain there for some time to drain, before they break the curd. When the curd is sufficiently drained, it is put into two or three separate vessels, and is broken with the hand as small as possible. During this part of the process, salt is scattered over the curd, and intimately mixed with it; the proportion, however, has not been correctly ascertained, and is regulated by experience.

6346. *Management in the press.* The breaking and salting completed, a cloth is spread over the cheese vat, and the broken curd being packed into it, and covered up with the cloth, a smooth round board is laid over the vat; which is usually filled to the height of one inch above the brim, to prevent the curd from shrinking below its sides, when the whey is squeezed out. The whole is then put into a press for two hours, and as it is of the utmost importance that every drop of whey should be expressed, skewers are thrust into the cheese through the holes in the lower part of the vat to facilitate its escape. The two hours expired, the cheese is taken out, and put into a vessel of warm or hot whey for an hour or two, in order to harden its skin. On taking the cheese out of the whey it is wiped dry, and when it has become cool, is wrapped in a clean dry cloth, of a finer texture, and again submitted to the press for six or eight hours. The cheese is now turned a second time, and is taken to the salting room, where it is rubbed on each side with salt; after which it is wrapped in another dry cloth, of a finer texture than either of the preceding cloths, and is again pressed for twelve or fourteen hours; if any edges project these are pared off, and the cheese being laid upon a dry board, is turned every day. In the salting room cheese should be kept warm until it has had a sweat, or has become regularly dry and somewhat stiff; as it is warmth that ripens cheese, improves its color, and causes it when cut to have a flakey appearance, which is the surest sign of superior excellence.

6347. *Management in the cheese-room.* After the processes of salting and drying are completed, the cheeses are deposited in the cheese-room or loft, which should be airy and dry; but on no account should hard and soft cheeses be placed in the same room, for the dampness or moisture arising from the latter, will cause the hard cheese to chill, become thick-coated, and often spotted. Throughout the whole process of cheese-making, the minutest attention will be requisite: for if the whey be imperfectly expressed, or the rennet be impure, or the cheese be not sufficiently salted, it will become rank and pungent. For this defect there is no remedy. The imperfect separation of the whey will cause cheese to heave or swell, as well as to run out at the sides. In order to prevent as well as to stop this heaving, the cheese must be laid in a moderately cool and dry place, and be turned regularly every day. If the heaving be very considerable, the cheese must be pricked on both sides in several places, particularly where it is most elevated, by thrusting a skewer into it: by this pricking, though the heaving will not be altogether prevented, a passage will be given to the confined air, the heaving or swelling will consequently be considerably reduced, and the cavities of the cheese will be less offensive to the eye. Another remedy for *heaving* in cheese, consists in applying a composition of nitre, and bole armeniac, which is vended in the shops under the name of *cheese-powder*. It is prepared by mixing one pound of saltpetre with half an ounce of bole armeniac thoroughly together, and reducing them to a very fine powder. About a quarter of an ounce of this is to be rubbed on a cheese, when put a second and third time into the press, half on each side of the cheese at two different meals, before the salt is rubbed on, that the cheese may be penetrated with it. This preparation is very binding, and sometimes proves serviceable, but the nitre is apt to impart an acid taste; and if too much be applied, and the cheese should be exposed to too great heat, the quantity of air already confined in it will be increased by fermentation, and the cheese will swell much more than it would, if no powder had been rubbed in. The greatest care, therefore, will be necessary whenever this remedy is adopted.

6348. *Hard and spoiled cheese* may be restored in the following manner: take four ounces of pearl-ash, and pour sweet white wine over it, until the mixture ceases to effervesce. Filter the solution, dip into it clean linen cloths, cover the cheese with them, and put the whole into a cool place, or dry cellar. Repeat this process every day, at the same time turning the cheese, and, if necessary, continue it for several weeks. Thus the hardest and most insipid cheese, it is affirmed, has frequently recovered its former flavor.

SECT. VI. Catalogue of the different Sorts of Cheeses and other Preparations made from Milk.

6349. *Of cheeses*, we shall first enumerate the British sorts, and next, those peculiar to foreign countries: the description of each will be such as to enable any ingenious dairymist to imitate them.

6350. *The brick-bat cheese* is so named from the form of the mould; it is formed of new milk and cream in the proportion of two gallons of the former to a quart of the latter. It is principally made in Wiltshire in the month of September, and should not be cut until it is twelve months old.

6351. *Chedder cheese*, so named from the vale of that name in Somersetshire, where it is exclusively made. It is made in cheeses about thirty pounds each, which have a spongy appearance, and the eyes are filled with a limpid and rich, but not rancid oil.

6352. *Cheshire cheese* is in universal esteem; it is made from the whole of the milk and cream, the

morning's milk being mixed with that of the preceding evening, previously warmed. The general weight is sixty pounds each cheese.

6353. *Dunlop cheese*, so named from the parish of Dunlop in Ayrshire, where it was originally made; the whole of the cream goes with the curd; the cheeses are from twenty to fifty pounds weight, and no coloring matter is used. A cheese in every respect similar is made in Derbyshire, excepting that these last are generally of a smaller size.

6354. *Gloucester cheese* is in very considerable demand from its mild taste, which suits most palates, especially those of the young and of simple habits: there are two kinds, double and single, the first made from the milk and cream, and the latter with the milk deprived of about half the cream: the latter are of course the least valuable; but as they may be often mistaken for the former, upright dairymen, Marshall observes, impress a heart-shaped stamp upon them to distinguish them from the former. They are made of various sizes, from twenty to seventy, or even eighty pounds weight, but generally, from fifty to sixty pounds.

6355. *Green, or sage cheese*, is made by steeping over night in a proper quantity of milk, two parts of sage, one part of marigold leaves, and a little parsley, after they have been bruised. On the following morning, the greened milk is strained off, and mixed with about one third of the whole quantity intended to be run or coagulated. The green and white milks are run separately, the two curds being kept apart until they be ready for vating: these may be mixed, either evenly and intimately, or irregularly and fancifully, according to the pleasure of the manufacturer. The management is the same as for common cheese. Green cheeses are made in the vale of Gloucester, as also in Wiltshire.

6356. *Lincolnshire cheese* is made by adding the cream of one meal's milk to that which comes immediately from the cow; it is pressed gently two or three times, and is turned for a few days previously to being used. It is chiefly made in spring, but the richest is that made in autumn. It will not keep above three months.

6357. *Norfolk cheese* is made from the whole of the milk and cream; the size is from thirty to fifty pounds; it is generally colored yellow, and is reckoned a good keeping cheese.

6358. *Soft, or slip-coat cheese*, is made from new milk hot from the cow, and the afterings; and what is required to make one pound of butter, will, in general, make one pound of cheese: this is a small soft rich cheese, which must be used immediately.

6359. *Stilton cheese*, which, from its peculiar richness and flavor, has been called the parmesan of England, is made in the following manner:—the night's cream is put to the morning's milk, with the rennet; when the curd is come, it is not broken as is usual with other cheese, but is taken out whole, and put into a sieve to drain gradually; while draining, it is gently pressed till it becomes firm and dry, when it is placed in a vat, a box made exactly to fit it; as it is so extremely rich, that without this precaution, it is apt to bulge out, and break asunder. It is afterwards kept on dry boards, and turned daily, with cloth binders round it, which are tightened as occasion requires. After being taken out of the vat, the cheese is closely bound with cloth till it acquires sufficient firmness to support itself: when these cloths are removed, each cheese is brushed once every day for two or three months, and if the weather be moist, twice every day; the tops and bottoms are treated in a similar manner daily before the cloths are taken off. Stilton cheese derives its name from the town where it is almost exclusively sold; it is made principally in Leicestershire, though there are also many who manufacture it in the counties of Huntingdon, Rutland, and Northampton. Sometimes the cheeses are made in a net, resembling a cabbage net, which gives them the form of an acorn, but these are neither so good nor so richly flavored, as those made in vats, having a thicker coat, and being deficient in that mellowness which causes them to be in such general request. (*Bath Papers*, vol. iii. p. 152, 153.) Stilton cheese is not reckoned to be sufficiently mellow for cutting, until it is two years old, and is not saleable unless it is decayed, blue, and moist. In order to mature them the more rapidly, it is a frequent practice to place the cheeses in buckets, which are covered over with horse-dung. Wine is also reputed to be added to the curd, in order to accelerate the ripening of the cheese.

6360. *Cottenham cheese*, from the town of that name in Cambridgeshire, is a thicker kind of cream cheese than the Stilton; its superior delicacy and flavor are attributed to the fragrant nature of the herbage on the commons on which the cows are pastured, and according to Professor Martyn, to the prevalence of *Poa aquatica* and *pratensis*.

6361. *Suffolk or skim cheese* is made of skimmed milk; it forms a part of every ship's stores, not being so much affected by heat as richer cheese, nor so liable to decay in long voyages.

6362. *Wiltshire cheese* is made of new milk coagulated as it comes from the cow, sometimes a small quantity of skimmed milk is added. In some dairies it is manufactured in winter as well as summer; in the former case it is liable to become scurvy and white coated; the last of which defects is frequently concealed by a coat of red paint.

6363. *Of foreign cheeses*, the most common is the *Dutch cheese*; this is prepared much in the same manner as the Cheshire cheese, excepting that muriatic acid is used instead of rennet, which renders it pungent, and preserves it from mites; that of Gouda is preferred.

6364. *Parmesan cheese* was formerly supposed to be made from the milk of goats, but it is merely a skim-milk cheese, the curd hardened by heat, well salted, pressed, and dried, long kept, and rich in flavor from the rich herbage of the meadows of the Po, where the cows are pastured.

6365. *The process*, according to Pryce, (*Bath Papers*, vol. vii.) is as follows:—the evening's milk, after having been skimmed in the morning, and standing till ten o'clock, and the morning's milk skimmed about two hours after it is drawn from the cow, are mixed together. The mixture is then suspended in a copper cauldron over a wooden fire (*fig. 53.*), and frequently stirred till it attains about 82° of Fahrenheit; the rennet is then put in, and the copper being removed from the fire, the coagulation quickly takes place, and the curd is afterwards worked with a stick till it is reduced to a small grain. The whey now occupies the surface, and a part of it being taken out, the cauldron is again turned over the fire, and its contents brought to nearly a boiling heat. A little saffron is now added to impart color, the whole being all the while well stirred, and the superintendent examining it from time to time with his finger and thumb, to ascertain the exact moment when the curd shall have become sufficiently solid. When this is the case, the cauldron is removed from the fire, and the curd allowed to subside; three fourths of the whey is then drawn off, water poured round the bottom of the cauldron outside to cool it, so as to admit of a cloth being passed below the curd, which is thus brought up and placed in a tub to clear. When drained, it is put into a wooden hoop, and about half a hundred weight laid on it for half an hour; the cloth is then removed, and the cheese being replaced in the hoop is laid on a shelf; here it remains for two or three days, at the end of which, it is sprinkled over with salt; this sprinkling is repeated every second day for about thirty days if it be summer, and for about forty or fifty-five days if it be winter, after which, no further attention is required. The best Parmesan cheese is that which has been kept for three or four years, but none is ever carried to market for sale, until it has been kept at least six months.

6366. *Swiss cheese* is of several varieties, mostly of skimmed or partially skimmed milk, and manufactured like the Parmesan. Its varied and rich flavor is more owing to the herbage of the pastures, than the mode of making; and some sorts, as the *Gruyère*

(so called from the bailiwick of that name in the canton of Fribourg), are, flavored by the dried herb of *Melilotus officinalis* (fig. 46.) in powder. Gruyère cheeses weigh from forty to sixty pounds each, and are packed in casks containing ten cheeses each, and exported to the most distant countries. This cheese requires to be kept in a damp place, and should frequently be washed with white wine, to preserve it from the depredations of insects. Neufchatel is celebrated for a very fine sort of cheese made there, which in shape resembles a wash-hand ball.

6367. *Westphalia cheese* is of the skim-milk kind, and of a different character from any of those hitherto described. The cream is allowed to remain on the milk till the latter is in a sub-acid state; it is then removed, and the milk placed near a fire spontaneously to coagulate. The curd is then put into a coarse bag, and loaded with ponderous stones to express the whey; in this dry state it is rubbed between the hands, and crumbled into an empty clean milk vat, where it remains from three to eight days according as the cheese is intended to be strong or mild. During this part of the process, which is called mellowing, the curd undergoes the putrid fermentation, and acquires a coat or skin on the top, before it is taken out of the vessel, and kneaded into balls or cylinders with the addition of a considerable portion of carraways, salt, and butter; or occasionally a small quantity of pounded pepper and cloves. When over-mellowed a third part of fresh curds, likewise crumbled into small pieces, is superadded, to prevent or correct its putrid tendency. As the balls or cheeses do not exceed three or four ounces each in weight, they soon dry in the open air, and are then fit for use. When nearly dry they are sometimes, for the palate of epicures, suspended in a wood fire chimney, in a net, for several weeks or months; and both their taste and flavor are said to be remarkably improved, whether kept in a dry air, or subjected to the action of smoke. This sort of cheese, M. Hochheimer, who describes it, affirms to be preferable to the Dutch, Swiss, and even Parmesan cheese. It is sometimes to be had in London, but is not very common.

6368. *Potatoe cheese* is a German manufacture, of which there are three sorts. One of the best is thus prepared. Select mealy potatoes, and only half dress them in steam, for by bursting their flavor and efficacy are diminished. Peel them, and then grate or beat them into a fine pulp. To three parts of this mass add two parts of sweet curd, knead and mix them, and allow them to stand three days in warm, and four or five days in cold weather; form into small pieces like the Westphalia cheeses, and dry in the same manner. A still better sort of potatoe cheese is formed of one part of potatoes, and three of the curd of sheep's milk. This sort is said to exceed in taste the best cheese made in Holland, and to possess the additional advantage that it improves with age, and generates no vermin.

6369. *The preparations of milk*, which can neither be included under butter nor cheese, are various, and constitute a class of wholesome luxuries or rural drinks. We shall do little more than enumerate them, and refer for further details to the cookery books.

6370. *Curds and whey* is merely coagulated new milk stirred up, and the curd and whey eaten together with or without sugar and salt.

6371. *Curds and cream*; here the whey is removed and cream substituted with or without sugar. The milk coagulated is often previously skimmed.

6372. *Sour cream*; cream allowed to stand in a vat till it becomes sour; when it is eaten with fresh cream and sugar, or new milk and sugar, and is found delicious.

6373. *Corstorphin cream*, so named from a village of that name two miles from Edinburgh, from which the latter city is supplied with it. The milk of three or four days is put together with the cream, till it begins to get sour and coagulated, when the whey is drawn off and fresh cream added. It is therefore simply *sour curd and fresh cream*; it is eaten with sugar as a supper dish, and in great repute in the north.

6374. *Devonshire cream*, is a term applied in the county of that name, sometimes to sour curd, and sometimes to sour cream; in either case mixed with new milk or fresh cream, and eaten with sugar like the Corstorphin cream.

6375. *Clotted cream*. The milk when drawn from the cow is suffered to remain in the coolers till it begins to get sour and the whole is coagulated. It is then stirred, and the whey drawn off, or the cream (now in clots among the curd) and the curd removed.

6376. *Hatted kilt*, a gallon of sour butter-milk is put in the bottom of the milk pail, and a quart or more of milk drawn from the cow into it by the milk-maid. The new warm milk as it mixes with the acid of the sour milk, coagulates, and being lighter rises to the top and forms a creamy scum or hat over the other, whence the name. This surface stratum is afterwards taken off, and eaten with sugar.

6377. *Milk syllabub* is formed in a similar manner over a glass or two of wine; and the whole is then eaten with sugar. Both sorts may be formed by those who have no cow, by warming the sweet or new milk, and squirting it into the wine or the sour milk.

6378. *Skim-milk*, is milk from which the cream has been removed; when this has been done within twelve or fifteen hours from the time of milking, it is sweet and wholesome, and fit either for being heated or coagulated, in order to make cheese, &c., or used as it is with other food; but if allowed to remain twenty or thirty hours it becomes sour, coagulates spontaneously, the whey separates from the curd, and if it remain a certain period, generally three weeks longer in a warm temperature, the vinous fermentation takes place, and a wine or a liquor from which ardent spirit may be distilled is produced.

6379. *Butter-milk*, is that which remains in the churn after the butter has been taken off. When butter has been made from cream alone, it is seldom of much value; but where the whole milk has been churned, and no water poured in during the process, it is a very wholesome cooling beverage. Some prefer it when it has stood a few days and become sour. In England it is chiefly given to pigs, but in Ireland it forms a very common diluter to porridge, potatoes, oat cakes, pease cakes, and other food of the laboring classes, and especially of the farm servants. In Scotland the same thing used formerly to be the case, but the practice there has within the last twenty years become nearly the same as in England; in the Orkney islands, and other northern parts of Britain, as well as in Ireland. Butter-milk is sometimes kept till it undergoes the vinous fermentation, when it is used to procure intoxication.

6380. *Whey*, when new and of a pale green color, forms an agreeable beverage, and with oatmeal makes an excellent gruel or porridge. Left till it gets sour, it undergoes the vinous fermentation as readily as butter-milk; and man, who in every state of civili-

zation feels the necessity of occasionally dissipating the cares of his mind, when he cannot find tobacco, opium, malt liquors, or ardent spirit, has recourse to sour whey.

CHAP. VI.

The Sheep. — *Ovis aries*, L.; *Mammalia Pecora*, L., and *Ruminaleæ*, Cuv. *Brebis*, Fr.; *Schaf*, Ger.; *Oveja*, Span. and *Pecora*, Ital.

6381. *The sheep* is an inhabitant of every part of the globe, from Iceland to the regions of the torrid zone. The varieties of form and clothing necessary to fit it for existing in so many climates are of course numerous. In most of these countries it is cultivated for its wool or flesh, and in many for both; but it is most cultivated in Europe, and especially in France, Spain, and Britain. In the latter country its culture has attained an astonishing degree of perfection. Besides the *O. aries*, or common sheep, there are three other species, the *O. Ammon* or Siberian sheep; the *Pudu* or South American, and the *Strepsiceros* or Cretan sheep. By some these are considered mere varieties. The Cretan and Siberian are cultivated in Hungary and Siberia.

6382. *The common sheep in a wild state* prefers open plains, where it herds together in small flocks, which are in general active, swift, and easily frightened by dogs or men. When completely domesticated, the sheep appears as stupid as it is harmless; it is characterised by Buffon as one of the most timid, imbecile, and contemptible of quadrupeds. When sheep, however, have an extensive range of pasture, and are left in a considerable degree to depend on themselves for food and protection, they exhibit a more decided character. A ram has been seen in these circumstances to attack and beat off a large and formidable dog, and even a bull has been felled by a stroke received between his eyes as he was lowering his head to receive his adversary on the horns and toss him in the air. Sheep display considerable sagacity in the selection of their food; and in the approach of storms, they perceive the indications with accurate precision, and retire for shelter always to the spot which is best able to afford it. The sheep is more subject to disorders than any of the domesticated animals; giddiness, consumption, scab, dropsy, and worms frequently seizing upon and destroying it. Of all disorders the most fatal is owing to vast numbers of worms of the genus *fasciola*, which are found in the liver and gall-bladder. They are of a flat form, of an oval shape, with slightly pointed extremities, and bear a general resemblance to the seeds of a gourd. The fly is another formidable enemy, and is often fatal in the course of twenty-four hours, breeding within the skull of the animal. To extricate the sheep from this danger, the French shepherds apply the *trephine* instrument, without the smallest hesitation, and with the greatest dispatch and success.

6383. *Of all the domestic animals of Britain*, Brown observes, *sheep are of the greatest consequence*, both to the nation and to the farmer; because they can be reared in situations, and upon soils, where other animals would not live; and, in general, afford greater profit than can be obtained either from the rearing or feeding of cattle. The very fleece, shorn annually from their backs, is of itself a matter worthy of consideration, affording a partial return not to be obtained from any other kind of stock. Wool has long been the staple commodity of this island, giving bread to thousands who are employed in manufacturing it into innumerable articles for home consumption, and foreign exportation. In every point of view, sheep husbandry deserves to be esteemed as a chief branch of rural economy, and claims the utmost attention of agriculturists. For many years back, it has been studied with a degree of diligence and assiduity not inferior to its merits; and the result has been, that this branch of rural management has reached a degree of perfection favorable to those who exercised it, and highly advantageous to the public.

SECT. I. *Of the Varieties of Sheep.*

6384. *The varieties of the O. aries, or common sheep*, dispersed over the world are, according to Linnæus, the hornless, horned, blackfaced, Spanish, many-horned, African, Guinea, broad-tailed, fat-rumped, Bucharian, long-tailed, Cape, bearded, and morvant; to which some add the Siberian sheep, cultivated in Asia, Barbary, and Corsica, and the Cretan sheep, which inhabits the Grecian islands, Hungary, and Austria; by Linnæus considered as species.

6385. *The varieties of British sheep* are so numerous that, at first sight, it appears almost impossible to reduce them into any regular classes. They may, however, be divided in two ways; first, as to the length of their wool; and, secondly, as to the presence or absence of horns; a third classification might be made after the place or districts in which such species are supposed to abound, to be in greatest perfection, or to have originated.

6386. *The long-wooled British sheep* are chiefly the *Teeswater, the *old and *new Leicester, the *Devonshire notes, Exmoor, and the Heath sheep.

6387. *The short-wooled sheep* are chiefly the Dorsetshire, *Hereford or Ryeland, the *South Down, the Norfolk, the *Cheviot, the *Shetland sheep, and the *Merino.

6388. *The hornless breeds* are those in the above classes marked (*), the others have horns. These breeds, and their subvarieties, may be further arranged according as they are suited to arable or enclosed lands, and to open or mountainous districts.

6389. *The sheep best suited to arable land*, an eminent writer observes, in addition to such properties as are common in some degree to all the different breeds, must evidently be distinguished for their quietness and docility; habits which, though gradually acquired and established by means of careful treatment, are more obvious, and may be more certainly depended on in some breeds than in others. These properties are not only valuable for the sake of the fences by which the sheep are confined, but as a proof of the aptitude of the animals to acquire flesh in proportion to the food they consume.

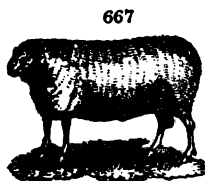
6390. *The long-wooled large breeds, are those usually preferred on good grass-lands*; they differ much in form and size, and in their fattening quality, as well as in the weight of their fleeces. In some instances, with the Lincolns or old Leicesters in particular, wool seems to be an object paramount even to the carcase; with the breeders of the Leicesters, on the other hand, the carcase has always engaged the greatest attention; but neither form nor fleece, separately, is a legitimate ground of preference; the most valuable sheep being that which returns, for the food it consumes, the greatest marketable value of produce.

6391. *The Lincolnshire, or old Leicestershire breed*, have no horns, the face is white and the carcase long and thin; the ewes weighing from 14 to 20 lbs., and the three-year-old wethers, from 20 to 30 lbs. per quarter. They have thick, rough, white legs, bones large, pelts thick, and wool long, from ten to eighteen inches, weighing from eight to 14 lbs. per fleece, and covering a slow-feeding, coarse-grained carcase of mutton. This kind of sheep cannot be made fat at an early age except upon the richest land, such as Romney-marsh, and the richest marshes of Lincolnshire; yet the prodigious weight of wool which is shorn from them every year, is an inducement to the occupiers of marshlands to give great prices to the breeders for their hogs or yearlings; and though the buyers must keep them two years more, before they get them fit for market, they have three clips of wool in the meantime, which of itself pays them well in those rich marshes. Not only the midland counties, but also Yorkshire, Durham, and Northumberland, can send their long-wooled sheep to market at two years old, fatter in general than Lincolnshire can at three. Yet this breed, and its subvarieties, are spread through many of the English counties.

6392. *The Teeswater sheep* (fig. 666.) differ from the Lincolnshire in their wool not being so long and heavy; in standing upon higher, though finer boned legs, supporting a thicker, firmer, heavier carcase, much wider upon their backs and sides; and in affording a fatter and finer-grained carcase of mutton: the two year old wethers weighing from 25 to 35 lbs. per quarter. Some particular ones, at four years old, have been fed to 55 lbs. and upwards. There is little doubt that the Teeswater sheep were originally bred from the same stock as the Lincolnshire; but, by attending to size rather than to wool, and constantly pursuing that object, they have become a different variety of the same original breed. (*Culley on Live Stock*, p. 122.) The present fashionable breed is considerably smaller than the original species; but they are still considerably larger and fuller of bone than the midland breed. They bear an analogy to the short-horned breed of cattle, as those of the midland counties do to the long-horned. They are not so compact, nor so complete in their form, as the Leicestershire sheep; nevertheless, the excellence of their flesh and fattening quality is not doubted, and their wool still remains of a superior staple. For the banks of the Tees, or any other rich fat-land county, they may be singularly excellent.



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6393. *The Dishley, or new Leicester breed* (fig. 667.), is distinguished from other long-wooled breeds by their clean heads, straight, broad, flat backs, round barrel like bodies, very fine small bones, thin pelts, and inclination to make fat at an early age. This last property is most probably owing to the before-specified qualities, and which, from long experience and observation, there is reason to believe, extends through every species of domestic animals. The Dishley breed is not only peculiar for its mutton being fat, but also for the fineness of the grain, and superior flavor, above all other large long-wooled sheep, so as to fetch nearly as good a price, in many markets, as the mutton of the small Highland and short-wooled breeds. The weight of ewes, three or four years old, is from 18 to 26 lbs. a quarter,

and of wethers, two years old, from 20 to 30 lb. The wool, on an average, is from 6 to 8 lbs. a fleece. (Culley, p. 106.)

6394. *The Devonshire Nots* (fig. 668.) have white faces and legs, thick necks, narrow backs, and back bone high; the sides good, legs short, and the bones large; weight much the same as the Leicesters, wool heavier, but coarser. In the same county, there is a small breed of long-wooled sheep, known by the name of the *Esmoor* sheep, from the place where they are chiefly bred. They are horned, with white faces and legs, and peculiarly delicate in bone, neck, and head; but the form of the carcase is not good, being narrow and flat-sided. The weight of the quarters, and of the fleece, about two-thirds that of the former variety.



6395. *The shorter woolled varieties, and such as, from their size and form, seem well suited to hilly and inferior pastures*, are also numerous. Generally speaking, they are too restless for inclosed arable land, on the one hand, and not sufficiently hardy for healthy mountainous districts, on the other. To this class belong the breeds of Dorset, Hereford, Sussex, Norfolk, and Cheviot.

6396. *The Dorsetshire sheep* (fig. 669.) are mostly horned, white faced, stand upon high small white legs, and are long and thin in the carcase. The wethers, three years and a half old, weigh from 16 to 20 lbs. a quarter. The wool is fine and short, from 3 to 4 lbs. a fleece. The mutton is fine grained and well-flavored. This breed has the peculiar property of producing lambs at almost any period of the year, even so early as September and October. They are particularly valued for supplying London and other markets with house lamb, which is brought to market by Christmas, or sooner if wanted, and after that, a constant and regular supply is kept up all the winter.



6397. *The Wiltshire sheep* are a variety of this breed, which, by attention to size, have got considerably more weight; viz. from 20 to 28 lbs. a quarter. These, in general, have no wool upon their bellies, which gives them a very uncouth appearance. The variations of this breed are spread through many of the southern counties, as well as many in the west, viz. Gloucestershire, Worcestershire, Herefordshire, &c.; though some of them are very different from the Dorsetshire, yet they are, Culley apprehends, only variations of this breed, by crossing with different tups; and which variations continue northward until they are lost amongst those of the Lincolnshire breeds. (Culley, p. 131.)



6398. *The Herefordshire breed* (fig. 670.) is known by the want of horns, and their having white legs and faces, the wool growing close to their eyes. The carcase is tolerably well formed, weighing from 10 to 18 lbs. a quarter, and bearing very fine short wool, from 1½ to 2½ lbs. a fleece: the mutton is excellent. The store or keeping sheep of this breed are put into cots at night, winter and summer, and in winter foddered in racks with peas-straw, barley-straw, &c., and in very bad weather with hay. These cots are low buildings, quite covered over, and made to contain from one to five hundred sheep, according to the size of the farm or flock kept. The true Herefordshire breed are frequently called *Ryeland* sheep, from the land formerly being thought capable of producing no better grain than rye; but which now yields every kind of grain. A cross between this breed and the merinos, was extensively cultivated by the late Dr. Parry, of Bath, an eminent wool-grower, and promoter of agricultural improvement.

6399. *The South Down sheep* (fig. 671.) are without horns; they have dark or black-grey faces and legs, fine bones, long small necks; are low before, high on the shoulder, and light in the fore quarter; the sides are good, and the loin tolerably broad, back-bone too high, the thigh full, and twist good. The fleece is very short and fine, weighing from 2½ to 3 lbs. The average weight of two years old wethers is about 18 lbs. per quarter, the mutton fine in the grain, and of an excellent flavor. These sheep have been brought to a high state of improvement by Elman, of Glynd, and other intelligent breeders. They prevail in Sussex, on very dry chalky downs, producing short fine herbage.



6400. In the *Norfolk sheep* the face is black, horns large and spiral; the carcase is very small, long, thin, and weak, with narrow chins, weighing from 16 to 20 lbs. per quarter; and they have very long dark or grey legs, and large bones. The wool is short

and fine, from 1½ to 2 lbs. per fleece. This race have a voracious appetite, and a restless and unquiet disposition, which makes it difficult to keep them in any other than the largest sheep-walks or commons. They prevail most in Norfolk and Suffolk, and seem to have been retained solely for the purpose of folding; as it does not appear they have any other good property to recommend them, besides being good travellers, for which they seem well adapted, from their very long legs and light clean carcasses.

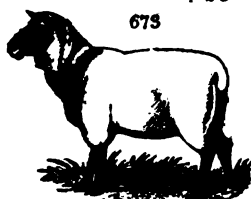
6401. *The Cheviot breed* (fig. 672.) are without horns, the head bare and clean, with jaws of a good length, faces and legs white. The body is long, but the fore-quarters generally want depth in the breast, and breadth both there and on the chine; though, in these respects, great improvement has been made of late. They have fine, clean, small-boned legs, well covered with wool to the hough.



The weight of the carcass, when fat, is from 12 to 18 lbs. per quarter; their fleece, which is of a medium length and fineness, weighs about 5 lbs. on an average. Though these are the general characters of the pure Cheviot breed, many have grey or dun spots on their faces and legs, especially on the borders of their native districts, where they have intermixed with their black-faced neighbors. On the lower hills, at the extremity of the Cheviot range, they have been frequently crossed with the Leicesters, of which several flocks, originally Cheviot, have now a good deal both of the form and fleece. The best kind of these sheep are certainly a very good mountain stock, where the pasture is mostly green sward, or contains a large portion of that kind of herbage, which is the case of all the hills around Cheviot, where those sheep are bred. Large flocks of them have been sent to the Highlands of Scotland, where they have succeeded so well as to encourage the establishment of new colonies; yet they are by no means so hardy as the heath or black-faced kind, which they have, in many instances, supplanted.

6402. *Of those races of sheep that range over the mountainous districts of Britain*, the most numerous, and the one probably best adapted to such situations, is the *heath breed*, distinguished by their large spiral horns, black faces and legs, fierce wild-looking eyes, and short, firm carcasses, covered with long, open, coarse shaggy wool. Their weight is from 10 to 16 lbs. a quarter, and they carry from 3 to 4 lbs. of wool each. They are seldom fed until they are three, four, or five years old, when they fatten well, and give excellent mutton, and highly flavored gravy. Different varieties of these sheep are to be found in all the western counties of England and Scotland, from Yorkshire northwards, and they want nothing but a fine fleece to render them the most valuable upland sheep in Britain.

6403. *The Herdwick sheep* (fig. 673.) are peculiar to that rocky mountainous district, at the head of the



Duddon and Esk rivers in the county of Cumberland. They are without horns, have speckled faces and legs, wool short, weighing from 2 to 2½ lbs. per sheep, which, though coarser than that of any of the other short-wooled breeds, is yet much finer than the wool of the heath sheep. The mountains upon which the Herdwicks are bred, and also the stock itself, have, time immemorial, been farmed out to herds, and from this circumstance their name is derived.

6404. *The dun-faced breed*, said to have been imported into Scotland from Denmark or Norway at a very early period, still exists in most of the counties to the north of the Firth of Forth, though only in very small flocks. Of this ancient race there are now several varieties, produced by peculiarities of situation, and different modes of management, and by occasional intermixture with other breeds.

We may, therefore, distinguish the sheep of the mainland of Scotland from those of the Hebrides, and of the northern islands of Orkney and Zetland.

6405. *The Hebridean sheep* is the smallest animal of its kind. It is of a thin, lank shape, and has usually straight shorn horns. The face and legs are white, the tail very short, and the wool of various colors; sometimes of a bluish grey, brown or deep russet, and sometimes all these colors meet in the fleece of one animal. Where the pasture and management are favorable, the wool is very fine, resembling in softness that of Shetland; but, in other parts of the same islands, the wool is stunted and coarse, the animal sickly and puny, and frequently carries four, or even six horns. The average weight of this poor breed, even when fat, is only 5 or 5½ lbs. per quarter, or nearly about 80 lbs. per sheep. It is often much less, only amounting to 15 or 16 lbs.; and the price of the animal's carcass, skin and all, is from 10s. to 14s. Fat wethers have been sold in the Long Island at 7s. a head, and ewes at 5s. or 6s. The quantity of wool which the fleece yields is equally contemptible with the weight of the carcass. It rarely exceeds one pound weight, and is often short of even half that quantity. The quantity of the wool is different on different parts of the body; and inattention to separating the fine from the coarse, renders the cloth made in the Hebrides very unequal and precarious in its texture. The average value of a fleece of this aboriginal Hebridean breed is from 8d. to 1s. sterling. From this account it is plain, that the breed in question has every chance of being speedily extirpated. (*Macdonald's Report of the Hebrides*, p. 447.)

6406. *Of the Zetland sheep* it would appear that there are two varieties, one of which is considered to be the native race, and carries very fine wool; but the number of these is much diminished, and in some places they have been entirely supplanted by foreign breeds; the other variety carries coarse wool above, and soft fine wool below. They have three different successions of wool yearly, two of which resemble long hair more than wool, and are termed by the common people *fers* and *scudda*. When the wool begins to loosen in the roots, which generally happens about the month of February, the hairs, or *scudda*, spring up; and when the wool is carefully plucked off, the tough hairs continue fast until the new wool grows up about a quarter of an inch in length, then they gradually wear off; and when the new fleece has acquired about two months' growth, the rough hairs, termed *fers*, spring up and keep root until the proper season

for pulling it arrives, when it is plucked off along with the wool, and separated from it, at dressing the fleece, by an operation called forsing. The scudde remains upon the skin of the animal as if it were a thick coat, a fence against the inclemency of the seasons, which provident nature has furnished for supplying the want of the fleece. The wool is of various colors; the silver grey is thought to be the finest, but the black, the white, the *moorvat*, or brown, is very little inferior, though the pure white is certainly the most valuable for all the finer purposes in which combing wool can be used. (*Sir John Sinclair on the different Breeds of Sheep, &c. Appendix, No. 4. Account of the Shetland Sheep, by Thomas Johnston, p. 79.*) In the northern part of Kincardineshire, as well as in most other of the northern counties, there is still a remnant of this ancient race, distinguished by the yellow color of the face and legs, and by the dishevelled texture of the fleece, which consists in part of coarse, and in part of remarkably fine wool. Their average weight in that county, is from seven to nine pounds a quarter, and the mutton is remarkably delicate and highly flavored. (*Kincardineshire Report, p. 385. Sup. E. Brit. art. Agr. 176.*)

6407. *The Spanish, or Merino breed, bears the finest wool of the sheep species; the*



males (*fig. 674.*) usually have horns of a middle size, but the females (*fig. 675.*) are frequently without horns: the faces and legs are white, the legs rather long, but the bones fine. The average weight per quarter of a tolerably fat ram, is about seventeen pounds, and that of ewes about eleven pounds. The shape of



this race is far from being perfect, according to the ideas of English breeders, with whom symmetry of proportion constitutes a principal criterion of excellence. The throatiness, or pendulous skin beneath the throat, which is usually accompanied with a sinking or hollow in the neck, presents a most offensive appearance, though it is much esteemed in Spain, as denoting both a tendency to fine wool, and a heavy fleece. Yet the Spanish sheep are level on the back, and behind the shoulders; and Lord Somerville has proved that there is no reason to conclude that deformity in shape is, in any degree, necessary to the production of fine wool.

6408. *The fleece of the Merino sheep weighs, upon an average, from three to five pounds; in color, it is unlike that of any English breed: there is on the surface of the best Spanish fleeces, a dark brown tinge, approaching almost to a black, which is formed by dust adhering to the greasy properties of its pile, and the contrast between this tinge and the rich white color below, as well as that rosy hue of the skin which denotes high proof, at first sight excites much surprise. The harder the fleece is, the more it resists any external pressure of the hand, the more close and fine will be the wool: here and there, indeed, a fine pile may be found in an open fleece, though this occurs but rarely. Nothing, however, has tended to render the Merino sheep more unsightly to the English eye, than the large tuft of wool which covers the head; it is of a very inferior quality, and classes with what is produced on the hind legs; on which account, it does not sort with any of the three qualities, viz. *rafinos*, or prime, *finos*, or second best, and *tercenos*, the inferior sort, and consequently, is never exported from Spain.*

6409. *Merinos were first brought into England in 1788, but did not excite much interest before his Majesty's sales, which began in 1804: the desirable object of spreading them widely over the country, and subjecting them to the experiments of the most eminent professional breeders, has been greatly promoted by the institution of the Merino Society in 1811, to which belonged some of the greatest landholders, and the most eminent breeders in the kingdom. For some years past, this breed has been on the decline. (Sup. E. Brit. art. Agr.)*

SECT. II. Criteria of Properties in Sheep.

6410. *The criteria of an excellent ram, as given by Culley, combines qualities which ought to be found in every breed of sheep cultivated for its flesh and wool. His head should be fine and small, his nostrils wide and expanded, his eyes prominent, and rather bold or daring, ears thin, his collar full from his breast and shoulders, but tapering gradually all the way to where the neck and head join, which should be very fine and graceful, being perfectly free from any coarse leather hanging down; the shoulders broad and full, which must, at the same time, join so easy to the collar forward, and chine backward as to leave not the least hollow in either place; the mutton upon his arm or fore-thigh, must come quite to the knee; his legs upright, with a clean fine bone, being equally clear from superfluous skin and coarse hairy wool, from the knee and hough downwards; the breast broad and well forward, which will keep his fore-legs at a proper wideness; his girth or chest full and deep, and instead of a hollow behind the shoulders, that part, by some called the fore-flank, should be quite full; the back and loins broad, flat, and straight, from which the ribs must rise with a fine circular arch; his belly straight, the quarters long and full, with the mutton quite down to the hough, which should neither stand in nor out; his twist, or junction of the inside of the thighs, deep, wide, and full, which, with the broad breast, will keep his four legs open and upright; the whole body covered with a thin pelt, and that with fine, bright, soft wool.*

6411. *The criteria of a sound healthy sheep*, are, a rather wild or lively briskness; a brilliant clearness in the eye; a florid ruddy color on the inside of the eyelids, and what are termed the eyestrings, as well as in the gums; a fastness in the teeth; a sweet fragrance in the breath; a dryness of the nose and eyes; breathing easy and regular; a coolness in the feet; dung properly formed; coat or fleece firmly attached to the skin, and unbroken; the skin exhibiting a florid red appearance, especially upon the brisket. Where there are discharges from the nose and eyes, it indicates their having taken cold, and should be attended to by putting them in dry sheltered situations. This is a necessary precaution also in bringing them from one situation to another while on the road.

6412. *The criteria of the age of sheep* is the state of their teeth: by their having, in their second year, two broad teeth; in their third year, four broad teeth; in their fourth year, six broad teeth; and in their fifth year, eight broad teeth before. After which, none can tell how old a sheep is while their teeth remain, except by their being worn down. About the end of one year, rams, wethers, and all young sheep, lose the two fore-teeth of the lower jaw; and they are known to want the incisive teeth in the upper jaw. At eighteen months, the two teeth joining to the former, also fall out; and at three years, being all replaced, they are even and pretty white. But as these animals advance in age, the teeth become loose, blunt, and afterwards black. The age of the ram, and all horned sheep, may also be known by their horns, which show themselves in their very first year, and often at the birth, and continue to grow a ring annually to the last period of their lives.

6413. *The different ages and conditions of sheep* have different names in different districts. After being weaned, the ram, or wedder lamb, is sometimes termed hog, hoggit, or tag, during the whole of the first year; and the female lamb, an ewe, or gimmer lamb, and ewe tag. The second year the wedder has the title of shear hog, or a two-toothed tag; and the ewe is called a thaive, or two-toothed ewe. In the third year, a shear hog, or four-toothed wedder; and a four-toothed ewe or thaive. The fourth year, a six-toothed wedder, or ewe; and in some places, from the time of lambing till that of salving, the males are called tup-lambs; and from that period, till the time of shearing, tup-hogs, and ever afterwards, tups: the females in the same order being termed, ewe-lambs, ewe-hogs, gimmers, young ewes, old ewes. The gelded male lambs, castrated wedder lambs, wedder hogs, dummonds, wedders. Crones also signify old ewes; and there are several other provincial names, which are explained in their proper places.

SECT. III. *Of Breeding Sheep.*

6414. *In the breeding of sheep* a greater degree of perfection has been attained than in any other live stock; and in this branch, in particular, the breeders of England stand higher than those of any other country. Bakewell, by careful selection during several generations, raised his stock to a state of excellence, in regard to fattening at an early age with a moderate consumption of food, and with the smallest proportion of offal, which has been with difficulty equalled, certainly has not been exceeded, by the most skilful of his successors. It is a striking instance of the division of labor and skill, that there are breeders who devote themselves entirely to the breeding of rams for the purpose of letting out on hire. This practice originated in Lincolnshire, where in the early part of the last century, rams were let out at from 10s. to 20s. each; but so great has been the improvement since that period that they are now let out to common graziers at from 1 to 10 guineas, and to breeders of rams at from 20l. to 200 guineas. The breeding rams are shown for hire at certain times and places during the summer, where every one may select such as promise to maintain or improve the particular state of his flock, and at such prices as his means and experience may justify. Two or more individuals frequently join together in the hire of one ram, to which they put the best of their ewes, for the purpose of obtaining superior males for the future service of the rest of their flocks; and in particular cases, when the owner of the ram does not choose to part with him, even for a season, ewes are sent to him to be covered at a certain price per head; superior animals of this class being very seldom sold altogether. Much as this mode of doing business has been reprobated as a monopoly, and much as there sometimes may be of deception in making up rams for these shows, all intelligent practical men must agree, that there can be no better method of remunerating eminent breeders, and of spreading their improvements most widely, in the shortest period, and at the least possible expense. A single ram thus communicates its valuable properties to a number of flocks, often in distant parts of the country, without distracting the attention of ordinary breeders from their other pursuits.

6415. *The two methods of breeding* common to all animals are also adopted in breeding sheep. Breeding from different families of the same race, commonly called breeding *in and in*; and breeding from different races, generally called *cross breeding*. Bakewell, according to Sir J. Sebright, (*On improving the Breeds of domestic Animals, &c.*), effected his improvements by breeding from the same family; but according to Hunt, who

has written an able answer to Sir J. Sebright's pamphlet, (*Letter, &c. to Sir J. Sebright, &c.*), he bred from different relationships of the same family; it being out of his power to breed from different families of a race which he was at the time employed in forming, and cross breeding he did not approve of. Breeding in and in is so repugnant to human feeling, that it is difficult to avoid considering it an unnatural practice; for it does not follow that a flock of sheep in a wild state must necessarily breed in the nearest relationships, as father and daughter, &c.; on the contrary, it is more probable that remoter relationships would be chiefly bred from, as these must necessarily be much more numerous. In a flock of sheep, or a herd of savage men, springing each from one pair, every parent must necessarily have many more cousins, and cousins many times removed, than he can have mothers or daughters.

6416. *Breeding from different families of the same race* is the more general and approved practice. When a number of families of any breed have been for some time established in a variety of situations, and have had some slight shades of difference impressed upon them, by the influence of different soils and treatment, it is found advantageous to interchange the males, for the purpose of strengthening the excellencies, or remedying the defects of each family. Of this advantage, Bakewell could not avail himself; but it has been very generally attended to by his successors. Culley, for many years, continued to hire his rams from Bakewell, at the very time that other breeders were paying a liberal price for the use of his own; and the very same practice is followed by the most skilful breeders at present. In large concerns, two or more streams of blood may be kept distinct for several generations, and occasionally intermixed with the happiest effects, by a judicious breeder, without having recourse to other flocks. (*Sup. E. Brit. art. Agr. 177.*)

6417. In *breeding from two distinct races*, the object is to acquire new properties or remove defects. The mode of effecting this by cross breeding is attended with greater difficulties than in breeding from the same race. The very distinction of breeds implies a considerable difference among animals in several respects; and although the desirable property be obtained, it may be accompanied by such others as are by no means advantageous to a race; destined to occupy a situation which had excluded that property from one of its parents. To cross any mountain breed with Leicester rams, for example, with a view to obtain a propensity to fatten at an early age, would be attended with an enlargement of size, which the mountain pasture could not support; and the progeny would be a mongrel race, not suited to the pastures of either of the present breeds. If the object be to obtain an enlargement of size, as well as a propensity to fatten, as is the case when Cheviot ewes are crossed with Leicester rams, the progeny will not prosper on the hilly pastures of their dams, and will be equally unprofitable on the better pastures of their sires. But the offspring of this cross succeeds well on those intermediate situations on the skirts of the Cheviot hills, where, though the summer pasture is not rich, there is a portion of lowland for producing clover and turnips. (*Supp. Encyc. Brit. art. Agr. &c.*)

6418. As *general rules in crossing breeds* it is to be noticed that in every case where the enlargement of the carcass is the object, the cross breed must be better fed than its smaller parent. The size of the parents should also be but little disproportioned at first; and when some increase has been produced, one or more crosses afterwards may raise the breed to the required size. With these precautions, there is little reason to fear disappointment, provided both parents are well formed. (*General Report of Scotland, vol. iii. p. 14. 18.*)

6419. *The most advantageous and proper age for ewes taking the ram* in the different breeds has not been fully shown; but from a year to a year and a half old may be sufficient, according to the forwardness of the breed and the goodness of the keep. Some judge of this by the production of broad or sheep's teeth. It should not be done while too young in any case.

6420. In regard to the *season of putting the rams to the ewes*, it must be directed by the period at which the fall of the lambs may be most desirable, which must depend on the nature of the keep which the particular situation affords; but the most usual time is about the beginning of October; except in the Dorsetshire ewes, where the intention is suckling for house-lamb, in which case it should be much earlier, in order that the lambs may be sufficiently forward. But, by being kept very well, any of the breeds will take the ram at a much earlier period. Where the rams are young, the number of ewes should seldom exceed sixty for each ram; but in older rams a greater number may be admitted without inconvenience, as from one to two hundred; but letting them have too many should be cautiously avoided, as by such means the farmer may sustain great loss in the number of the lambs.

6421. With respect to the *period of gestation*, the ewe goes with lamb about the space of five months, consequently the most common lambing-season is March, or the early part of April; but "it has been observed that in many of the more southern districts, where sheep-lusbandry is carried on to a considerable extent, some parts of the ewe-stock are put to the rams at much earlier periods, so as to lamb a month or six weeks sooner; a

practice which is attended with much profit and advantage in many situations where early grass-lamb is in great demand. It is usual for the rams to remain with the ewes for a month or six weeks, and in some cases longer, in order to complete the business of impregnation, which in some districts is ascertained by smearing the fore-bows of the rams with some coloring substance."

6422. *The practice of turning a number of rams among the flocks, formerly adopted, is highly exceptionable, as tending to prevent the main object, and injure the rams. A better way is to let each ram have a proper number of ewes, and with very choice stock to keep the ram in an inclosed small pasture, turning a few ewes to him, and as they are served replacing them with others. By this means there is more certainty, and more ewes may be impregnated. In such sort of fine stock, it is likewise of great utility to keep the rams during this season in a high manner. In this view a little oats in the straw, or a mixture of barley and pea meal, are excellent. Where ewes are backwards in taking the ram, the best means to be employed are those of good stimulating keep. The rams should always be continued with the ewes a sufficient length of time.*

6423. *The ewe will breed twice or even thrice a year, if it be made a point to produce such an effect by attention and high keep, since she will receive the male indifferently at any season, and, like the rabbit, very soon after bringing forth. Lisle gives an instance of three of his ewes, well kept, lambing at Christmas, fattening off their lambs at Lady-day, and producing lambs again the first week in June. It seems they stole the ram immediately after lambing, but brought the second time only single lambs, although of a breed that generally produces twins. There is no doubt but the sheep would produce young thrice a year, were the bad practice resorted to, which has been so currently recommended with the rabbit, of allowing the male immediately after parturition; the ready way to render both the female and her progeny worthless. Could the lambs be advantageously weaned at two months, sufficient time would, he conceives, remain for the ewe to bring forth twice within the year: for example, suppose the young ewe tupped in August, the lamb would be dropped in the middle of January, and might be weaned in mid March, the ewe again receiving the ram on the turn of the milk, like the sow, perhaps in or before April, she would then bring forth within the twelve months or in August. This plan would, continues Lisle, at least injure the dam infinitely less than suckling during gestation.*

6424. *When ewes are in lamb they should be kept in the pastures, and as free from disturbance as possible, being carefully attended to, in order to prevent accidents which are liable to take place at this time, such as those of their being cast in the furrows, &c. Where any of the ewes slip their lambs, it is advised by Bammler that they should be immediately removed from the flock. They also require, under these circumstances, to be kept as well as the nature of the farm will admit, in order that there may be less loss at lambing-time from the ewes being stronger, and the lambs more healthy, and better capable of contending with the state of the season at which they may be dropped. The shepherd should at this period be particularly careful and attentive to afford his assistance where it may be necessary. He should constantly have regard to the suckling of the lambs, and to see that the udders of the ewes are not diseased. His attendance will often be required in the night as well as the day. At this season covered sheep folds are often of very great advantage, in saving and protecting both ewes and their lambs.*

6425. *In respect to the number of lambs at a birth, it is remarked by Lawrence that the ewe brings most commonly one, next in degree of frequency, two, rarely from three to five lambs at a birth. This property of double birth, is, he says, in some instances specific; the Dorset sheep usually yeanning twins, and the large polled Belgic sheep, with their descendants, our Teeswater, doing the same, and producing occasionally more at a birth. Other breeds bring twins, in the proportion of one third of the flock, which is supposed to depend considerably on good keep. A certain number of ewes per centum prove barren annually: the cause very rarely, natural defect; sometimes over-fatness, a morbid state of body from poverty or neglect of the ram, in other words want of system in the shepherd.*

6426. *The keep of sheep after lambing, where rich pastures or other kinds of grass lands cannot be reserved, should consist of turnips or other kinds of green food provided for the purpose, and given them in a suitable manner; but where it can be done, it is always better to leave this sort of food untouched till about the period of lambing, when it should be regularly supplied in proportion to the necessity there may be for it. The ewes also demand at this time much care to see that they are put upon a dry sheltered pasture, free from disturbance, and that neither they or their lambs sustain injury from the too great severity of the season. Whenever this is the case, they should be carefully removed into a proper degree of warmth and shelter until perfectly restored. It is likewise a necessary as well as useful practice, as they lamb down, to take them and their lambs away from the common stock, putting them into a piece of turnips or fresh dry pasture where there is shelter when necessary, as by this means much fewer lambs would be lost than would otherwise be the case. It is also found that by a proper supply of turnips or other similar green food at this period, the milk of the ewes is much increased, and the growth of the lambs greatly promoted; which is of much future importance, as when they are stinted at this early period of their existence, they never turn out so well afterwards for the farmer. With the green and root crops and preserved after-grass, hay, straw, corn, and oil cake, are in some cases made use of in the winter support of sheep stock. With turnips, where the soil is not sufficiently dry to admit the sheep, it is the practice to draw them and convey them to a sound firm pasture, that the ewes may be served upon them once or twice in the day, as there may be occasion, care being taken that they are eaten up clean, as the circumstance of their being thus eaten may be consumed with the greatest economy. In this way this sort of food will be consumed for a grain crop, eating the turnips on the land, by means of portions hurled off as wanted, is a good practice. With this sort of*

food, especially where it produces scouring in the ewes, green rouse hay, cut straw, or pease haulm should constantly be given, and also with rape, &c.

6427. *The castrating lambs* may be performed any time from the age of a fortnight or three weeks, to that of a month or six weeks, and in some districts it is deferred to a considerably later period. It is, however, the safest method to have it executed early, as there is less danger of too much inflammation taking place. But in all cases the lambs should be in a healthy state when it is done, as under any other circumstances they are liable to be destroyed by it. The operation is usually performed by the shepherd, by opening the scrotum or cod, and drawing out the testicles with the spermatic cord. This he often does with his teeth in the young state of the animal. But where the operation is performed at a later period, it is usual to have recourse to the knife, the arteries being taken up and secured by means of ligatures, or the searing iron. The business, if possible, should be done in fine weather, when not too warm, and the gelded lambs be kept in a dry, sheltered, quiet situation for a few days, until the inflammation is gone off. If it should happen to be wet at the time, it may be advisable to have them under some sort of shelter, where they can have room to move freely about.

6428. *The weaning of lambs* should be effected when they are three or four months old, as about July, but it is done more early in some districts than in others. A proper reserve of some fresh pasture grass, where there may be a good bite for the lambs to feed upon, should be had recourse to, as it is of much consequence that an ample provision of this sort be had, in order that the growth of this young stock may not suffer any check on being taken from the mother. Where they have been continued so long as to graze with the dams, little check will be sustained in their separation if turned upon such good feed. Some advise clover in blossom as the most forcing sort of food in this intention, and with others saintfoin rouse is highly valued for the same purpose. When good feed is not provided, of some of these kinds, the lambs soon decline in flesh, or, in the technical language of the flock, are said to pitch; and when once this happens, they never afterwards thrive so well, however good the management may be. With regard to the ewes, they should be removed to such distant pastures, or other places as that they may not be heard by the lambs, which would cause them to be disturbed in their feeding. And where the ewes sustain any inconvenience from their milk, as by their udders swelling, it should be drawn once or twice, as by this means bad consequences may be prevented. And as soon as the lambs have been removed, the ewes are returned upon the pastures destined for their summer support. There is, however, one caution to be attended to in first turning the lambs upon rich keep, which is that of letting them be in some degree satisfied with food previously, that they may not be surfeited by too quick and full feeding, and *heave* or *hove* as it is termed; keeping them gently moving about the field has also been advised in this intention. In some places where the lands are of the more poor kind, it is a custom to send the lambs to the more rich vale or marsh districts, to be brought forward in condition or fattened. In those cases, where the lambs of the male kind are reared on the home lands, as wethers, they are usually restored to the flock in the latter end of the year, but which is not by any means a good practice, as they often suffer for want of proper keep in the winter, and lose what they had previously gained in growth and condition.

SECT. IV. *Of the Rearing and general Management of Sheep.*

6429. *In the practice of sheep husbandry different systems are had recourse to*, according to the extent and nature of the farms on which they are kept, and the methods of farming that are adopted on them; but under all circumstances the best sheep-masters constantly endeavor to preserve them in as good condition as possible at all seasons. With the pasture kinds of sheep this is particularly the case; and with the view of accomplishing it in the most complete manner, it is useful to divide them into different parcels or lots in respect to their ages and sorts, as by that practice they may be kept with greater convenience and benefit than in large flocks together under a mixture of different kinds; as in this way there is not only less waste of food, but the animals thrive better, and the pastures are fed with much more ease. The advantage of this management has been fully experienced in many of the northern districts, where they usually divide the sheep-stock into lambs, yearlings, wethers, and breeding ewes: and in this method it appears not improbable that a much larger proportion of stock may be kept, and the sheep be preserved in a more healthy condition. With a breeding stock the sheep-master must act according to his circumstances, situation, and capital which he possesses, either selling the lambs to go to keep, fattening them for grass lamb, suckling them for house lamb, or keeping them on to be grazed and sold as store or fat wethers; the ewes being sold lean as they are called, or fattened as circumstances, profit, and convenience may point out.

6430. *Another practice*, but which requires much capital as well as knowledge, experience, and attention, is that of breeding and fattening off all lambs, both wethers and ewes, especially where markets for their sale when fat, are conveniently situated; or this system may be partially acted upon, varying the plan according to capital, circumstances, and the nature of the times. In which case, whenever store stock become extravagantly high, it is mostly a good way to sell.

6431. *The sheep farming of the arable or low warm districts of the kingdom consequently differs in various particulars from that of the hilly and mountainous districts; we shall therefore first give a general view of the sheep management of arable lands, and next of mountainous districts.*

SUBJECT. 1. *Of the Rearing and Management of Sheep on rich grass and arable Lands.*

6432. *The most general sheep husbandry on rich lands, or where turnips and other green food is raised for winter consumption, is to combine the breeding and feeding branches, leaning to each according to the returns of profit: a method very common among arable farmers, and which is attended with the least trouble and hazard, is that of purchasing a store flock, as lambs, wethers, and what are termed crones, or old ewes; some of the last sort often proving with lamb, may be fattened off with them to good account. It is likewise often the case that ewes are disposed of in lamb, or with lambs by their sides, in what are termed couples, in which circumstances, it is frequently a good practice to make annual purchases of them, in order to the fattening of both, and selling them in that state within the year. In the purchasing of sheep, which is often done from very distant fairs and markets, much care and circumspection is necessary, whatever the sort or intention with which they are bought may be. In these cases much advantage, especially when at a considerable distance, may be derived, by employing a salesman on the spot.*

6433. *The treatment of the lambs is the first consideration in the mixed sheep husbandry: lambs are either suckled or fattened on grass, or sold in autumn as lean stock. Those that have been suckled or fattened in the house, in which system of fattening, much attention is required to have them early, to their being well, regularly, and very cleanly kept and suckled, as well as to the ewes being of the right sort, and the best milkers that can be provided, and to their being fully supplied with food of the most nourishing and succulent kinds. Their tails and udders should have the wool well clipped away from them, in order that they may be preserved in a perfectly clean state. The lambs also require, especially towards the close of their fattening, to have regular supplies of barley, wheat, and pease meal, ground together in combination with fine green rouen hay. When these have been sold off, the lambs which have been fattened on the best grass land will be ready to succeed them at the markets, in the spring and summer months, and these will be followed by the sale of the store lambs, at the different autumnal fairs.*

6434. *The selection or setting of the lamb-stock is the first business of sheep management after the lambs have been weaned. It is generally performed in the month of August, at which period the fairs for the sale of lambs mostly take place. And as at this time the whole are collected together for drawing into different lots, it is a very suitable period for selecting or choosing those that are to supply such deficiencies in the breeding flocks. In his *Calendar of Husbandry*, Young has remarked, that in making this selection the farmer or his shepherd usually (whatever the breed may be) rejects all that manifest any departure from certain signs of the true breed: thus, in a Norfolk flock, a white leg, and a face not of a hue sufficiently dark, would be excluded, however well formed; in the same manner a white face on the South Downs; in Wiltshire a black face would be an exclusion, or a horn that does not fall back; in Dorsetshire a horn that does not project, &c.*

6435. *The selection of the grown stock generally takes place after the lambs are weaned, or, at all events, before tupping season, though wethers may be drawn out of the flock at any time. A certain number of old ewes or crones are removed every year, and these as well as the wethers, are fed off for the butcher, either on grass, artificial herbage, or roots, according to the situation and circumstances of the farm, and season of the year.*

6436. *The shearing of sheep is an annual operation, which includes several preparatory measures and after-processes. These are, washing, separation, catching, clipping, marking, and tail cutting.*

6437. *The proper time for clipping or shearing sheep must be directed by the state of the weather and the climate in the particular district, as by this means the danger of injury by cold from depriving the sheep of their coats at too early a season, and from heat by permitting them to continue on them too long, may be avoided in the best manner: but another circumstance that should likewise be attended to in this business, is that of the wool being fully grown or at the state of maturity; as where the clipping precedes that period, it is said in the *Annals of Agriculture* to be weak and scarcely capable of*

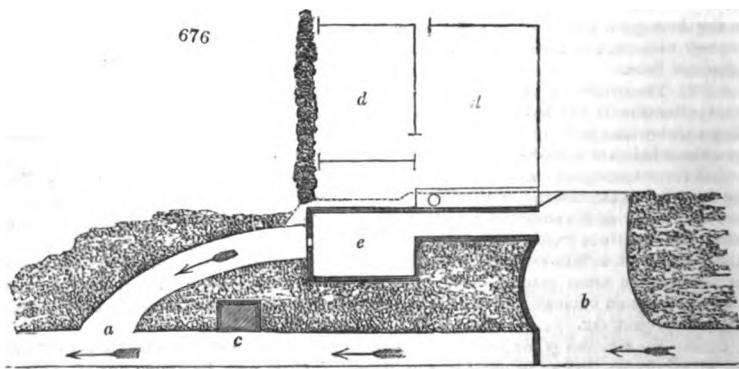
being spun, and if protracted later, it is yellow, felted, and of an imperfect nature. It has been stated, that for the more warm sheltered situations in the southern parts of the kingdom, the beginning or middle of June, when the weather is fine, may be in general the most proper; but in the more exposed districts in the northern parts of the island, the middle or latter end of the same month may be more suitable, provided the season be favorable. But with the fattening sheep in the inclosures, it will mostly be necessary to perform the work at an earlier period in every situation, as the great increase of heat from the setting in of the summer weather, added to the warmth of the fleece, becomes very oppressive and injurious to them in their feeding.

6438. *Sheep-shearing, in Romney Marsh*, commences about midsummer, and finishes about the middle of July. Those who shear first, think they escape the effects of the fly, and those that shear late, apprehend they gain half a pound weight in every fleece, by the increased perspiration of the sheep. In early shearing, the wool has not the condition which it afterwards acquires, but the hot weather occasions a good deal of trouble in detecting the fly. The lambs are generally shorn, especially in the northern districts, a few weeks after the old sheep, and the operation is termed *skirting*. The lambs that are sold in Smithfield market are, we believe, seldom or ever shorn.

6439. *Clipping off the coarse soiled wool* about the thighs and docks, some weeks before the usual time of washing and clipping the sheep, is an excellent practice; as by this means the sheep are kept clean and cool when the season is hot, and with ewes the udders are prevented from becoming sore.

6440. In *separating* for the purpose of washing, the flock is brought to the side of the washing-pool, and there lambs and sheep of different kinds, fit to be washed, are put into separate fields; and such lambs as are too young to be clipped are not washed, but confined in a fold or enclosure of any kind, at such a distance from the washing place as that they may not disturb their mothers by their bleating. The object of washing is simply to free the fleece from dust and dirt of various kinds. In Devonshire and Spain, the short-wooled sheep are not washed.

6441. In *performing the operation of washing*, it was formerly the method to have the washers standing up to the breast in the water; but from the inconvenience and danger of it, the men requiring a large supply of spirituous liquors, and being liable to be attacked with colds, rheumatisms and other diseases, as well as being apt to dispatch the work with too much expedition, so as to leave the wool insufficiently clean; it has been proposed by Young, in his *Calendar*, to rail off a portion of the water in a stream or pond (fig. 676.), for the sheep to walk into by a sloping mouth

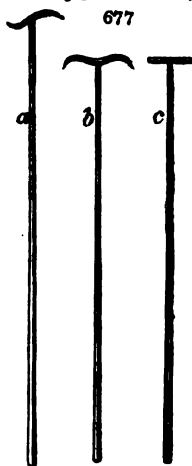


at one end (a), and to walk out by another at the other end (b), with a depth sufficient at one part for them to swim; and to pave the whole: the breadth need not be more than six or seven feet. At one spot on each side of this passage, where the depth is just sufficient for the water to flow over the sheep's back, a cask or box (c), water-tight, should be fixed, for a man to stand in dry; the sheep being in the water between them, they wash in perfection, and pushing them on, they swim through the deep part, and walk out at the other mouth, where a clean pen (d), or a very clean dry pasture is ready to receive them; of course there is a bridge rail-way to the tubs, and a pen at the first mouth of the water (c), whence the sheep are turned into it, where they may be soaking for a few minutes before being driven to the washers. But other more cheap contrivances may be provided, where there is clean water at hand for the purposes.

6442. *After sheep are washed*, they should on no account be driven on dry or dusty roads; but should have a clean hard pasture for a few days, until they are perfectly dry and in a proper condition to be shorn.

6443. The common method of catching the sheep, in order to lay it on its back to be shorn, is by the hinder leg, drawing the animal backward with a crook (fig. 677 a, b, c) to the adjacent shearing place; the hand holding the leg to be kept low, when at the place it is turned on its back; or they are moved bodily, or one hand placed on the neck, and another behind, and in that manner walked along: the first or common mode he thinks the most safe. Sheep fed on rich pastures, and fleshy, if handled hard and bruised, the parts are liable to fatal mortifications; an accident which often happens, on which accounts pens upon some lands are obliged to be lined with woollen, or many would die from bruises.

6444. In performing the operation of shearing, the left side of the sheep is placed against the shearer's left leg, his left foot at the root of the sheep's tail, and his left knee at the sheep's left shoulder. The process commences with the shears at the crown of the sheep's head, with a straight cut along to the loins, returning to the shoulder, and making a circular shear around the off side to the middle of the belly; the off hinder leg next: then the left hand holding the tail, a circular shear of the rump to the near hock of the sheep's hind leg; the two fore feet are next taken in the left hand, the sheep raised, and the shears set in at the breast, when the remaining part of the belly is sheared round to the near stifle; lastly, the operator kneeling down on his right knee, and the sheep's neck being laid over his left thigh, he shears along the remaining side.



6445. The method in Northumberland is to begin at the back part of the head, in order to give room for the shears to make their way down the right side of the neck, to the middle of the breast. The man then sits down upon his right knee, laying the head of the sheep over his left knee bent, and beginning at the breast, clips the underside of the throat upwards to the left cheek; then takes off the back of the neck, and all the way down below the left shoulder. He then changes to the contrary side, and makes his way down to the open of the right flank. This done, he returns to the breast, and takes off the belly, after which it matters not which side he clips, because being able to clip with either hand, he meets his shear points exactly at the middle of the back, all the way, until he arrive at the thighs or legs. He then places the sheep on its left side, and putting his right foot over the neck, and the other forward to the undermost hind leg, clears the right side; then turning the sheep over, finishes the whole.

6446. The fleece being removed, is wound up; that is, deprived of any clotted wool or dirty part, and lapped with the shorn side outwards, beginning at the breech and ending at the shoulders, where the neat wool serves as a bandage.

6447. Marking is performed on each sheep as soon as the fleece is removed. The object is to identify the individuals as the property of the master. Sometimes initials are impressed, and at other times other marks. They are impressed by stamps, or merely chalked or painted on. A stamp dipped in warm tar is the most durable mode. Some place the mark on different parts of the sheep, according to its age; others cut the margin of the ears in different ways.

6448. Shortening the tails of the sheep is performed in almost all the sheep districts of the kingdom except in Dorsetshire, which seems to be an useful practice in keeping the animals more clean behind, and of course less liable to be stricken with the fly. It has however been suggested in the ninth volume of *Annals of Agriculture*, that by this custom the sheep may be rendered less able to drive away the flies. The general prevalence of the practice would, however, seem to prove its being of advantage. There is much difference in the manner of performing the business in different districts in respect to the length, but four or five inches being left, is quite sufficient. It is usually done while the animals are young. In all sheep pastures the hedges should be well cleared from briars, as their coats are often injured by being torn by them. And all sorts of pernicious reptiles should be as much as possible destroyed, and removed from such land.

6449. The mode of pasturing sheep, or of feeding them on herbage or roots having been described when treating of these crops, the more general practices of rearing and management of lowland sheep husbandry may be considered as developed. Some peculiar practices and the mode of fattening lambs will be found in subsequent sections.

SUBJECT. 2. Of the Rearing and general Management of Sheep on Hilly and Mountainous Districts, or what is generally termed Store Sheep Husbandry.

6450. The best store farmers in Britain, are unquestionably those on the Cheviot hills, which border the two kingdoms, and an account of their management may be considered as applicable to the mountainous districts of the whole kingdom. It is indeed applied by the migrations of the Cheviot and Teviotdale farmers, both in the North Highlands, on the Sutherland estate, and in Wales. No regular system of store farming, as observed by Napier, (*Treatise on Store Farming*), appeared previously to his

own; and accordingly from this work, and an excellent account published in the *Supplement to the Encyclopædia Britannica*, we have extracted what follows.

6451. *A general idea of the extent and nature of a store farm may be obtained by referring to that of Thirlstone in Ettrick forest, a plan of which (fig. 678.) is given by*

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Captain Napier. It contains one thousand six hundred and fifty-one acres; of which one thousand four hundred and sixty-four acres are in open hill pasture, seventy in plantation, forty in arable and meadow, about sixty in six enclosures, and the rest in shepherd's and other cottager's houses, with their allowance of ground for a garden and cow. What distinguishes this farm from most others is the number of stells or small circular enclosures (O) for sheltering and feeding cattle during storms of snow, which are distributed over it; being no fewer than thirty-seven. The advantages of these stells in districts where sheep are liable to be buried by snow, Captain Napier considers very great, and to promote their more general introduction seems to have been one principal inducement for publishing his book. We shall recur to the subject in the following section, when treating of coting, folding, housing, &c.

6452. *In the practice of store farming* the rams are put to the ewes for the purpose of copulation in November, a little earlier or later, according to the prospect of spring food, but seldom before the eighth or tenth of that month. The number of rams required is more or less, according to the extent of the pasture, and their own age and condition. If the ewes are not spread over an extensive tract, one ram to sixty ewes is generally sufficient. It is usually thought advisable to separate the gimmers (sheep once shorn) from the older ewes, and to send the rams to the latter eight or ten days before they are admitted to the former. Notwithstanding this precaution, which retards their lambing season till the spring is farther advanced, ewes which bring their first lamb when two years old, the common period on the best hill farms, are often very bad nurses, and in a late spring lose a great many of their lambs, unless they are put into good condition with turnip before lambing, and get early grass afterwards. This separation, and difference in the time of admitting the rams to the ewes and gimmers, should therefore be always attended to. When a farm under this description of stock has the convenience of a few good inclosures (as in Thirlstone farm for example), still more minute attention is paid by skilful managers. It is not sufficient that the rams are carefully selected from perhaps

double the number, the ewes also are drawn out and assorted, and such a ram appropriated to each lot, as possesses the properties in form or fleece in which the ewes are deficient. In other cases, the best ram and the best lot of ewes are put together. When neither of these arrangements can be adopted, owing to the want of inclosures, it is the practice to send the best rams to the ewes for a few days at first, and those of an inferior description afterwards. In every case, when the farmer employs rams of his own flock, he is careful to have a few of the best ewes covered by a well formed and fine-woolled ram, for the purpose of obtaining a number of good ram-lambs, for preserving or improving the character of his stock.

6453. *The stock through winter*, in a mere breeding farm, consists of ewes and gimmers, which should have lambs in spring; ewe lambs or hogs; and a few young and old rams. All these are sometimes allowed to pasture promiscuously, but on the farms around Cheviot, the ewes and ewe hogs are kept separate, and the ewe hogs are either put on rough pastures, which have been lightly stocked in the latter end of summer, or get a few turnips once a day, in addition to the remains of their summer pasture. The most effectual preventive of the desolating distempers to which sheep of this age are liable, is turnips; and though they should never taste them afterwards, a small quantity is frequently given them during their first winter. After the rams have been separated from the ewes, they are usually indulged with the same feeding as the hogs.

6454. *The ewes, during winter*, are seldom allowed any other food than what their summer pasture affords, except that a small part of it may sometimes be but lightly eaten, and reserved as a resource against severe storms. When these occur, however, as they often do in the Cheviot district, there is little dependence on any other food than hay. When the snow is so deep as completely to cover the herbage, about two stones *avoids* of hay are allowed to a score of sheep daily, and it is laid down, morning and evening, in small parcels on any sheltered spot near the house, or under the shelter of *stalls* or clumps of trees, on different parts of the farm.

6455. *The ewes in March*, at least the gimmers or young ewes, are commonly allowed a few turnips once a day, on farms on which there is any extent of arable land; which are either carted to their pastures, or eaten on the ground, by bringing the sheep to the turnip field through the night. A part of the field, in the latter case, is cut off by nets, or by hurdles, which inclose the sheep in the same way as if they were intended for fattening. When they are ready to drop their lambs, they are no longer kept on the turnip field, and get what turnips may be left on their pastures. But it is seldom that the turnips last so long, though it is desirable to have a few remaining to be given to the weakest ewes, or to such as have twins, in a separate inclosure.

6456. *A few days before the time of lambing*, the ewes are collected for the purpose of being udder-locked. The sheep are raised upon their buttocks, their backs next to the operator, who then bends forward and plucks off the locks of wool growing on or near the udders, for the purpose of giving free access to the expected lambs. At the same time he ascertains the condition of the ewes, and marks such as do not appear to be in lamb, which may then be separated from the others. This operation is not without danger, and several premature births are usually the consequence. It is therefore not so general a practice as it was formerly, though still a common one on many, if not on most farms.

6457. *The separation of the hogs from the ewes*, where these have been allowed to pasture promiscuously, should always take place at the commencement of the lambing season, and the lowest and finest part of the pasture exclusively appropriated to the nursing ewes. On the Cheviot hills the hogs are generally pastured apart on the coarser herbage.

6458. *The lambing season* commences with the first or second week of April, according to the time at which the rams were admitted; and such as have twins, generally lamb among the first of the flock. At this season, the most constant attention is indispensable on the part of the shepherds, both to the ewes in labor, and to the newly dropped lambs. Though the Cheviot ewes are not so liable to losses in parturition, as some larger breeds which are in higher condition, and though they make good nurses, unless they are very lean, and their food scanty, yet, among a large flock, there are always a number that need assistance in lambing, and in a late spring not a few who have not milk sufficient for their lambs, particularly among the gimmers or young ewes. A careful shepherd at this time always carries a bottle of milk along with him, which he drops from his own mouth into that of the lamb that may need it; brings the ewes that have little milk to a better pasture, or to turnips, and confines such as have forsaken their lambs in a small pen, or barrack as it is called, temporarily erected in some part of the farm-steading. The same confinement is necessary when it is wished to make a ewe that has lost her own lamb, nurse that of another ewe that has had twins, or that has perished in lambing, or is from any other cause incapable of rearing her lamb. The ewe after being shut up a few hours with the strange lamb, usually admits it to the teat, and ever after treats it as her own; though sometimes a little deception is necessary, such as covering the stranger with the skin of her own lamb. At this important season, an inclosure of rich early grass, near the shepherd's cottage, is of vast advantage. Thither he carries the ewes and twins, such as have little milk; those that have been induced to adopt another's offspring; and generally, all that need to be frequently inspected, and are in want of better treatment than the rest of the flock. (*Supp. &c.* 178.)

6459. *Castration* is performed in the male lambs when a few days old, the ewe lambs

are never spayed: mild weather is chosen, and the operation performed in a fold on small quantities at a time.

6460. *The late lambing ewes* are separated from the ewes and lambs at the end of the lambing season, and kept by themselves, that they may be more under the eye of the shepherd, than if scattered over all the pasture. It is desirable to allow them fine grass for a few weeks after lambing, that their lambs may come to be nearly equal to the rest of the flock when weaned; or if they are too late for this, that they may get ready for the butcher by the month of August, beyond which period the ewes must be much injured by suckling them. (*Supp. &c.*, art. *Agr.* 179.)

6461. *Washing*, in store-farming, is performed when the wool has risen sufficiently, which is easily known by the appearance of a new growth. The barren sheep are brought to the washing pool. Sometimes they are hand-washed by men who stand in the pool, and have the sheep forced towards them singly; but more commonly, the Cheviot sheep, especially if the flock be numerous, are compelled to leap into the pool in a body for three or four times successively; and it is desirable that they should have room to swim a little, and come out on a green low bank on the opposite side. After being washed, the sheep are preserved as far as possible from rubbing against earthen dykes or banks, and from lying down on any dirty spot which might soil their wool. (*Supp. &c.*)

6462. *Marking*, as in general sheep-farming (6447.), takes place before the shorn sheep are turned out to pasture; they are marked, commonly with the owner's initials, by a stamp, or *boost* in provincial language, dipped in tar heated to a thin fluid state, and it is not unusual to place this mark on different parts of the body, according to the sheep's age.

6463. *The weaning of lambs* takes place when they are about three months old, sometimes sooner. When the ewes are gathered to be washed or shorn, the ewe lambs to be kept for supplying the place of the old ewes occasionally sold, are stamped in the same way as the ewes. The store-lambs are sent to some clean grassy pasture for a few weeks; and where the farm does not afford this accommodation, they must be *summered*, as it is called, at a distance. Several farms near Cheviot, and on the Lammermuir hills in Berwickshire, are appropriated to this purpose, the owner of the lambs paying so much a-head for six or eight weeks. In the mean time the ewe hogs, or gimmers as they are denominated after shearing, have joined the ewe stock, and the lambs, when brought home, go to the pasture which they had occupied. Wherever they may be kept in winter, it is always desirable to allow them a few turnips, along with a full bite of coarse herbage.

6464. *The practice of milking ewes* after the separation of the lambs is still continued in a few places. This very objectionable management is generally continued for six or eight weeks. The value of the milk of each ewe for this time, may not exceed from one shilling to one shilling and six-pence a-head, and the sheep are injured to at least three times that amount, independent of accidents at the milking fold. The cream is separated from the ewe milk, and made into butter for smearing, and the milk itself mixed with cow milk, and converted into cheese. The most skilful store-masters, however, have either laid aside milking, unless for a few days, or have shortened the period to two or three weeks.

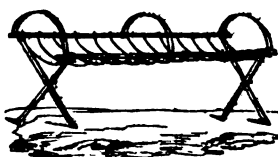
6465. *The selection of the crones or old ewes* to be sold, generally takes place in September or October, when they are sold to the feeder, and replaced by lambs of the current year. On the lower hills, ewes are generally disposed of after having lambed three seasons, or under four and a half years of age. In some situations they are kept on till a year older; but when they are purchased, as they usually are, to be kept another year on lower grounds, it is commonly for the interest of the store-farmer, to sell them when still in their full vigor. Skilful managers do not content themselves with drafting them merely according to age; and as there is no disadvantage in keeping a few of the best another year, they take this opportunity of getting rid of such of the flock of other ages as are not of good shapes, or are otherwise objectionable. As soon as the ewes to be disposed of are drawn from the flock, they are kept by themselves on better pasture, if the circumstances of the farm will admit of it. Sometimes they are carried on till they are fattened, and turnips are often purchased for them at a distance. When this is the case, it is not thought advisable to keep them longer, than till between Christmas and Candlemas, as an old ewe does not improve like a wether in the spring months. (*Supp. &c.*)

6466. *The salting or smearing of sheep* is an operation scarcely known in England, and not practised by the Welsh: some store-farmers in the milder districts of the northern counties, consider it unnecessary, but in all very cold situations it is still employed. The object of this operation is to destroy vermin, to prevent cutaneous diseases, and to promote the warmth and comfort of the animal during the storms of the ensuing winter. It is not necessary with sheep kept on low grounds, and well fed during winter, and it may occasionally be omitted for one season, particularly with old sheep, without material injury; but notwithstanding the ridicule that speculative writers have attempted to throw upon the practice, it is almost universally considered necessary and beneficial on high exposed situations, by the store-farmers of the border hills. Smeared wool does not sell so high as white wool, but the greater weight of the former more than compensates for the difference in price. (*General Report of Scotland*, vol. iii.) The season of salting or smearing is usually towards the end of October or beginning of November, before the rams are sent to the ewes. The most common materials are butter and tar, mixed in different proportions; a greater proportion of tar being employed for the hogs or young sheep than for the older ones. The proportions are also different on almost every farm,

and more tar is thought to be necessary, according to their greater elevation and exposure. In Roxburghshire, some mix two gallons of tar with thirty-six pounds of butter, as a sufficient allowance for three score of sheep, but for the same number it is more common to allot only one stone (twenty-four pounds) of butter, to two gallons of tar. (*Roxburghshire Report*, p. 155.). A common proportion of late has been about fourteen pounds of butter, to two Scotch pints of tar (nearly $3\frac{1}{2}$ quarts English wine measure), for ewes, and eleven pounds to the same quantity of tar for hogs. This mixture should smear from twenty to twenty-five of each, which is the number one man can do in a day. The expense, according to present prices, will be about nine-pence for each sheep: and the articles, such as oil, palm-grease, tallow, &c., have been recommended in place of butter; but none of them are in general use, and the only addition that is approved of is a little butter-milk. The butter is slowly melted and poured upon the tar, and the mixture is constantly stirred till it becomes cool enough for use. The wool is accurately parted into rows from the head to the tail of the animal, and the salve is carefully spread upon the skin with the point of the finger at the bottom of each row. (*Sup. En. Brit. art. Agr.* 180.)

6467. *The care of sheep during storms* is a business requiring constant attention. In storms of wind and rain, or what are called *black storms* by the shepherds, the sheep will, in a great measure, take care of themselves, by pasturing in situations naturally sheltered. All that is required from it here is to remove any of the more delicate into a covered fold or sheep house; though such conveniences are seldom to be found on mountain farms. But in a storm of snow the natural shelter to which the sheep have recourse, becomes the great receptacle of drift, and the harbinger of death to the flock. It is in such situations that Captain Napier purposes to place his stalls, or circular folds, (fig. 678 O), into which the sheep should be driven, or will naturally enter on the commencement of the storm. The round form for these stalls or folds is decidedly preferable to any figure with straight lines, as these invariably harbour drift. Where no artificial shelter is provided immense losses sometimes take place on mountain farms: The sheep are buried many feet deep in the snow; and though the shepherd, with such assistants as he can procure, armed with poles and spades, and aided by the sagacity of his dog, may dig out a few, yet the greater number perish. While the sheep remain in artificial shelters of any kind they must of course be fed; and the only convenient food in such cases is hay, straw, or dried spray — the latter, fortunately, seldom resorted to in this country, which should be put into baskets, or racks. (fig. 679.) The Ryeland breed of sheep in Herefordshire, and some of the flocks in the Highlands of Scotland, are put under cover nightly throughout the year: a practice which has probably originated in security, and been continued as matter of convenience and habit.

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SECT. V. Of the Folding of Sheep.

6468. *Cotting or folding* is a practice more or less extensively followed with particular breeds and in particular districts, but now generally on the decline. It was formerly thought to be indispensably necessary to the success of the farmer in different districts; but of late a different opinion has prevailed, except in particular cases, and it is considered as merely enriching one field at the expense of another. The practice may however be beneficial where there are downs, heaths, or commons. Folding has been chiefly confined to England, and a small part of Wales and Ireland. The object is to enrich the arable land; but as this is done at the expense of the pasture, it is truly, as Bakewell expressed it, “robbing Peter to pay Paul.”

6469. *The sheep best adapted to the fold* are those of the more active, short-woolled varieties, such as the Norfolk, Wiltshire, and South Down breeds; the heavy long-woolled kinds being less hardy, and some of them, as the Leicesters, much too valuable for a mode of treatment that converts them into dung carriers. The following calculation by Marshal will show, that though, in open lands, the practice may be in some cases tolerated on the ground of convenience or expediency, it can possess no recommendation as a profitable mode of management in other circumstances.

6470. *This morning* (September 29d, 1780), measured a sheep-fold, set out for six hundred sheep, consisting of ewes, wethers, and grown lambs. It measures eight by five and half rods, which is somewhat more than seven rods to one hundred, or two yards to a sheep.

6471. *August 29, 1781.* Last autumn made an accurate experiment, on a large scale, with different manures for wheat, on a sandy loam, summer fallowed. Part of an eighteen acre piece was manured with fifteen or sixteen loads of tolerably good farm-yard dung an acre; part with three chaldrons of lime an acre; the rest folded upon with sheep twice; the first time at the rate of six hundred sheep to a quarter of an acre (as in first minute), the second time thinner. In winter and spring, the dung kept the land; and now, at harvest, it has produced the greatest burden of straw. The sheep-fold kept a steady pace from seed-time to harvest, and is now evidently the best corned, and the cleanest crop. The

limb, in winter and spring, made a poor appearance, but after some showers in summer, it flourished much, and is now a tolerable crop, not less, I apprehend, than three quarters of an acre.

6472. *From these data* the value of a sheep-fold, in this case, may be calculated. It appears from the first minute, that one hundred sheep manured seven square rods daily. But the second folding was thinner; suppose nine rods, this is, on a par of the two foldings, eight rods a day each folding. The dung could not be worth less than half a crown a load; and the carriage and spreading ten shillings an acre; together fifty shillings an acre; which quantity of land the hundred sheep teathed twice in forty days. Supposing them to be folded the year round, they would, at this rate, fold nine acres annually; which, at fifty shillings an acre, is twenty-two pounds ten shillings a hundred, or four shillings and sixpence a head. In some parts of the island, the same quantity of dung would be worth five pounds an acre, which would raise the value of the teathe to nine shillings a head; which, at two-pence a head a week, is more than the whole year's keep of the sheep. It does not follow, however, that all lands would have received equal benefit with the piece in consideration; which, perhaps, had not been folded upon for many years, perhaps never before; and sheep folds, like other manures, may become less efficacious the longer it is used on a given piece of land. (*Marshall's Rural Economy of Norfolk*, vol. ii. p. 29.)

6473. *To fold on land in tillage all the year* is nearly impracticable; and where it could be done, the manure would be greatly diminished in value from rain and snow, to say nothing of the injury to the sheep themselves. So that the estimate of four shillings and sixpence, or nine shillings a head, is evidently in the extreme.

6474. *According to Arthur Young*, (*Farmer's Calendar*), the same land will maintain one-fourth more stock when the animals are allowed to depasture at liberty, than when confined during the night in folds. The injury to the stock themselves, though it is not easy to mention its precise amount with any degree of accuracy, cannot well be doubted, at least in the case of the larger and less active breeds, when it is considered that they are driven, twice a day, sometimes for a distance of two, or even three miles, and that their hours of feeding and rest are, in a great measure, controlled by the shepherd and his boy. When they are kept in numerous parcels, it is not only driving to and from the fold that affects them, but they are in fact driving about in a sort of march all day long, when the strongest have too great an advantage, and the flock divides into the head and tail of it, by which means one part of them must trample the food to be eaten by another. All this points the very reverse of their remaining perfectly quiet in small parcels.

6475. *The result of Parkinson's experience* is "that were the pasture sheep of Lincolnshire to be got into a fold once a-week, and only caught one by one, and put out again immediately, it would prevent their becoming fat." (*Parkinson on Live Stock*, vol. i. p. 367.) The only sort of folding ever adopted to any extent by the best breeders is on turnips, clovers, tares, and other rich food, where the sheep feed at their ease, and manure the land at the same time.

6476. *Folding in littered yards* is described by Dickson (*Complete Farmer*, art. *Sheep*) as combining all the advantages of folding on arable lands without any of its disadvantages. By this practice the sheep are confined at night in a yard well and regularly littered with straw, stubble, or fern; by which means the flock is said to be kept warm and healthy in bad seasons, and at the same time a surprising quantity of manure accumulated. A great improvement on this method, it is said, would be, giving the sheep all their food (except their pasture) in such yard, viz. hay and turnips: for which purpose they may be brought up not only at night, but also at noon, to be baited; but if their pasture be at a distance, they should then, instead of baiting at noon; come to the yard earlier in the evening, and go out later in the morning. This is a practice, he says, that cannot be too much recommended; for so warm a lodging is a great matter to young lambs, and will tend much to forward their growth: the sheep will also be kept in good health; and, what is a point of consequence to all farms, the quantity of dung raised will be very great. If this method is pursued through the months of December, January, February, March, and April, with plenty of litter, one hundred sheep will make a dunghill of at least sixty loads of excellent stuff, which will amply manure two acres of land; whereas one hundred sheep folded (supposing the grass dry enough) will not, in that time, equally manure an acre.

6477. *Our opinion of this sort of folding*, so warmly recommended by Sir J. Sinclair and A. Young, in the husbandry of Scotland, coincides with that of a very superior judge, who says, "that such a method may be advantageous in particular cases, it would be rash to deny; but generally, it is not advisable, either on account of the sheep, or any alleged advantage from the manure they make. As to the sheep, this driving and confinement, especially in summer, would be just as hurtful as folding them in the common way, and it has been found that their wool was much injured by the broken litter mixing with the fleece in a manner not to be easily separated: besides, now that it is the great object of every skilful breeder to accelerate the maturity of his sheep, as well as other live stock; among other means, by leaving them to feed at their ease, and if circumstances permit, in small parcels; such a practice as this can never be admissible in their management; and with regard to manure, there can be no difficulty in converting into it, any quantity of straw, stubble, and fern, by cattle fed in fold-yards, on green herbage in summer, and turnips, or other succulent food, in winter; while the soil, especially if it be of a light porous quality, is greatly benefited both by the dung and treading of sheep, allowed to consume the remainder of both sorts of food on the ground. It is true, that the dung of sheep has been generally supposed to be more valuable than that of cattle, but accurate experiments have not been made to determine the difference in this respect, among these and other polygastric animals. The greater improvement of pastures by sheep, is probably owing as much to their mode of feeding, as to the richer quality of their dung." (*Sep. E. Brit. art. Agr.*)

Sect. VI. Of Fattening Sheep and Lambs.

6478. *The subject of fattening sheep* may be considered in regard to the age at which fattening is commenced, the kind of food, and the manner of supplying it.

6479. *The age at which sheep are fatted* depends upon the breed, some breeds, such as the Leicester, maturing at an earlier age than others, under the same circumstances; and also in the abundance and quality of the food on which they are reared; a disposition to early obesity, as well as a gradual tendency towards that form which indicates a propen-

sity to fatten, being materially promoted by rich food, while the young animals are yet in a growing state. On good land, the Leicester wethers are very generally brought to a profitable state of fatness before they are eighteen months old, and are seldom kept for fattening beyond the age of two years: the Highland breeds, on the other hand, though prepared, by means of turnips, a year at least sooner than they could be in former times, usually go to the shambles when from three to four years old. The ewes of the first description are commonly fattened after having brought lambs for three seasons, that is, after they have completed their fourth year, and those of the small breeds, at from five to seven years of age, according to circumstances. (*Sup. E. Brit. art. Agr.*)

6480. *The kinds of food on which sheep are fattened, are good pastures, permanent or temporary, herbage crops, as clovers, tares, &c., turnips, and other roots; and linseed cake, grains, or other edible refuse of the oil manufactory, brewery, and distillery.*

6481. *The mode of feeding on rich pastures, herbage, and turnips, has already been described when treating of these crops, and it remains only to notice the modes of using grains and oil cake. These and also bran, oats, pease, and other grains and meals, whether given in winter or summer, should always be accompanied with pasture or dry food of some sort, especially hay. All food of this sort should be given in moveable troughs, divided in the middle, so that the sheep may feed on each side, with a sloping roof over them, so as to cover the sheep's heads and necks while feeding, as wet is not only prejudicial to the sheep, but spoils the food. A rack for hay, fixed over the trough, might probably be made to answer in this intention, while it would be very convenient for holding that material, and preventing waste. The whole should be fixed on wheels, and be made to stand steady, and a sufficient number for the quantity of sheep, be always in readiness. In the fattening of wethers, the use of barley meal, with grass or some other sort of green food, has likewise been found highly beneficial, and when it can be procured at a reasonable rate, should not be neglected, as it is quick in rendering them fat, and the mutton is excellent. A pound of oil cake, or of meal per day, with hay, or turnips, for each crone or wether, is reckoned a fair allowance in Lincolnshire. In the report of that county, several instances of oil cake feeding are given, by which it appears that that sort of food fattens in a shorter time than any other, is the most suitable food for fattening old sheep, and a rapid promoter of the growth of the wool.*

6482. *As general rules for fattening sheep, as well as other animals, it should be made a rule never to allow them to lose flesh from the earliest age, till they are sent to the butcher; that it is found of much advantage with a view to speedy fattening, as well as to the economy of food, to separate a flock into divisions, corresponding with its different ages, and the purpose of the owner as to the time of carrying them to market; and that the change from the food of store to fattening stock, from that which is barely capable of supporting the condition which they have already attained, to that which is adapted to their speedy improvement in fattening, ought to be gradual and progressive. Thus, very lean sheep are never, in good management, put to full turnips in winter, nor to rich pastures in summer; they are prepared for turnips in good grass land; often on the after-grass of mown grounds, and kept on second year's leys, and afterwards a moderate allowance of turnips, if they are fattened on pastures. It is a common practice, in the instance of the Leicesters, to keep all that are not meant for breeding always in a state of fatness, and after full feeding on turnips through winter and spring, to finish them on the first year's clover early in summer, when the prices of meat are usually the highest.*

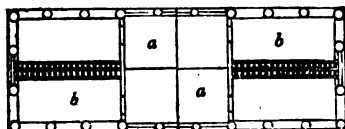
6483. *The fattening of lambs during summer, requires nothing more than keeping their mothers and them on the richest and best pasturage, and supplying such artificial food as the situation, season, or other circumstances may require; but the fattening of lambs during winter and spring, requires attention to three things, the breed, or if any breed be used indifferently, the period of dropping, the lamb house, and the feeding.*

6484. *With respect to the breed, as the sheep will take the ram at any season, any variety may be so managed as to drop their lambs at any period of the year, but it is found by experience, that the Dorsetshire sheep is easiest made to yearn, and therefore this is the sort generally employed in Middlesex for rearing what is called house lamb, for the metropolis. The selection of the rams for breeding the lambs to be house fed, is, according to Middleton, founded on the following circumstances: the sucklers, salesmen, and butchers of London, are aware that such lambs as have sharp bars on the inside of their lips, are certainly of a deep color after being butchered; and all those whose bars are naturally blunt, do as certainly produce fair meat. This knowledge has been the occasion of many lambs of the latter kind being kept for rams, and sent into Dorsetshire expressly for the purpose of improving the color of the flesh of house lambs, the issue of such rams can generally be warranted fair, and such meat always sells at a higher price; hence arose the mistaken notion that Middlesex rams were necessary to procure house lambs.*

6485. *A lamb-house may be any close shed, cow-house, or other spare house, or, even on a small scale, a roomy pigstye. But they are built on purpose by the extensive dealers in this article; and one to suckle from one hundred and sixty to one hundred and eighty lambs at a time, should be seventy feet long, and eighteen feet broad, with three coops of different sizes at each end, so constructed as to divide the lambs according to*

their ages. A plan of a sheep-house, combining also a lamb-house, is given by Kraft in his *Rustic Designs*. It is wholly built of unbarked spars, or young fir-trees. The plan (fig. 680.), contains four close apartments with doors for the lambs (a), and four others with racks for the sheep (b). The elevation (fig. 681.) shows a gallery (c), which sur-

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rounds the building, and is used as a passage for viewing the sheep, handling them with the crook, and at night for the perambulations of a watch-dog. The roof being twenty feet from the floor, the interior is abundantly airy, which for sheep is an important object. Another design in the same work (fig. 682.), is accompanied by an elegant Italian watch-tower, with apartments therein for the shepherd.

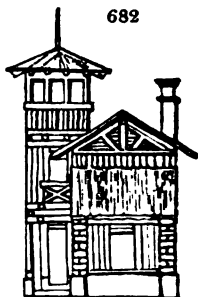
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6486. The economy of the suckling-house is as follows: The sheep which begin to lamb about Michaelmas are kept in the close during the day, and in the house during the night, until they have produced twenty or thirty lambs. These lambs are then put into a lamb-house, which is kept constantly well littered with clean wheat straw; and chalk, both in lump and in powder, is provided for them to lick, in order to prevent looseness, and thereby preserve the lambs in health. As a prevention against gnawing the boards, or eating each other's wool, a little wheat straw is placed, with the ears downwards, in a rack within their reach, with which they amuse themselves, and of which they eat a small quantity. In this house they are kept, with great care and attention, until fit for the butcher.

6487. The mothers of the lambs are turned, every night at eight o'clock, into the lamb-house to their offspring. At six o'clock in the morning, these mothers are separated from their lambs, and turned into the pastures; and at eight o'clock, such ewes as have lost their own lambs, and those ewes whose lambs are sold, are brought in and held by the head till the lambs, by turns, suck them clean: they are then turned into the pasture; and at twelve o'clock, the mothers of the lambs are driven from the pasture into the lamb-house for an hour, in the course of which time each lamb is suckled by its mother. At four o'clock, all the ewes that have not lambs of their own are again brought to the lamb-house, and held for the lambs to suck; and at eight, the mothers of the lambs are brought to them for the night.

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6488. This method of suckling is continued all the year. The breeders select such of the lambs as become fat enough, and of proper age (about eight weeks old), for slaughter, and send them to markets during December, and three or four succeeding months, at prices which vary from one guinea to four, and the rest of the year at about two guineas each. This is severe work for the ewes, and some of them die under excess of exhaustion. However, care is taken that they have plenty of food; for when green food (viz. turnips, cole, rye, tares, clover, &c.) begins to fail, brewer's grains are given them in troughs, and second-crop hay in racks, as well to support the ewes, as to supply the lambs with plenty of milk; for, if that should not be abundant, the lambs would become stunted, in which case no food could fatten them. (*Middlesex Report*, p. 355.)

SECT. VII. On the probable Improvement which may be derived from Crosses of the Merino Breed of Sheep.

6489. The Merino, or Spanish variety of the *Ovis Aries*, is supposed by Rozier and other French writers, to have been originally imported from Africa to Spain. It is, however, at least as probable, that they are indigenous to that country, or if originally imported, that they have become modified to what they are, by the soil and climate. Merinos first attracted attention in this country in 1764, in consequence of the reports of travellers, and a letter by Don John Bowley to Peter Collinson, published in the *Gentleman's Magazine* for that year. A few were imported in 1788, and more in 1791, and placed on the King's farm at Windsor, under the care of Sir Joseph Banks, who was then constituted His Majesty's shepherd. The first sale of stock was made in 1800; and from these, a flock imported from Spain in 1801, by Lord Somerville, and some other importations by different persons subsequently, have sprung all the Merinos and Merino rams in the empire. Since that period, a number of eminent breeders and scientific agriculturists have cultivated this breed both alone and by crossing, but especially Dr. Parry and Lord Somerville; and though the utility which its introduction may ultimately prove to the country can by no means be estimated at present, that it has already done much good by directing the public attention to the subject, there can be no

doubt; and many are of opinion, that by it the fleeces of our short-wooled sheep may be so improved as to render them fit substitutes for imported Spanish wool.

6490. *Dr. Parry's experiments* with the Merino breed were begun nearly at the same time with the King's. His farm was elevated, exposed, and unfit for any other purpose than breeding; and he fixed on the Ryeland breed, as one of the finest woolled varieties of British sheep, for crossing with Merino rams. His only object was the improvement of the fleece.

6491. *The effect of the fourth cross of the Merino ram*, according to the opinion of sheep cultivators on the continent, on any breed of ewes, however coarse and long in the fleece, will be to give progeny with short wool equal to the Spanish. Of the truth of this proposition, however, Dr. Parry justly expresses some doubts, derived from his own experience and that of others. But it is certain, he adds, that one cross more will, in most cases, effect the desired purpose. If we suppose, he says, the result of the admixture of the blood of the Merino ram to be always in an exact arithmetical proportion, and state the native blood in the ewe as 64; then the first cross would give $\frac{33}{64}$ of the Merino; the second $\frac{16}{64}$; the third $\frac{8}{64}$; the fourth $\frac{4}{64}$; the fifth $\frac{2}{64}$; the sixth $\frac{1}{64}$, and so on. In other words, the first cross would leave thirty-two parts in sixty-four, or half of the English quality; the second sixteen parts, or one-fourth; the third eight parts, or one-eighth; the fourth four parts, or one-sixteenth; the fifth two parts, or one-thirty-second; the sixth one part, or one-sixty-fourth, and so on. Now, if the filaments of the Wiltshire, or any other coarse wool, be in diameter double that of the Ryeland, it is obvious, that, according to the above statement, it would require exactly one cross more to bring the hybrid wool of the former to the same fineness as that of the latter. This, he believes, very exactly corresponds with the fact. The difference between one-eighth and one-sixteenth is very considerable, and must certainly be easily perceived, both by a good microscope, and in the cloth which is manufactured from such wool. In the latter method, he adds, "it certainly has been perceived; but I have hitherto had no opportunity of trying the difference by the former. The fifth cross, as I have before observed, brings the Merino-Wilts wool to the same standard as the fourth of the Merino Ryeland." (*Com. to the Board of Agr.* vol. v. p. 438.)

6492. In the *lambing season*, the Ryeland breed are usually cotted, because the newborn lambs are very thinly covered with wool. As January was considered the best lambing season for the produce of the cross, Dr. Parry found coting was doubly necessary. Every night the flock were well sheltered; and they were allowed, in addition to the pasture which they could pick up in the day-time, linseed jelly, ground oil-cake, or grains, cabbages, rousen, winter and spring vetches, and tares. Salt, he says, I never gave to my flock but once, and that in the following way: A small field of lattermath, cut in September, had been so often wetted, that I despaired of its ever being eaten. While it was putting into the rick, I strewed some salt between the layers; the consequence was, that cows and sheep greedily devoured it, scarcely leaving a single blade. (*Com. to the Board of Agr.* vol. v. p. 505.)

6493. *The shearing of the sheep* was performed in the second week of June, and of the lambs at the end of July. The finer fleeced lambs need not be shorn till the second season. Washing previously to shearing Dr. Parry disapproves of; because the fleece is so thick, that when thoroughly soaked with water, it is very long in drying; and if the weather prove wet and cold, the sheep are evidently much incommoded; he, therefore, recommends cleansing the wool, after being shorn, as in Spain.

6494. *The produce of wool*, considered as the result of Dr. Parry's well conducted experiments, was found to be 14lb. 14oz. per acre, which at 3s. per lb. in the yolk throughout the fleece gives 2l. 4s. 7½d. per acre on land certainly not worth on an average 26 shillings. (*See Comm. to the B. of Agriculture*, vol. v.)

6495. *Lord Somerville's experiments* may be considered as of equal, if not more importance than these of Dr. Parry. His Lordship tried crosses with several short woolled breeds, but was most successful with the South Downs and Ryelands. Morris Birkbeck, a professional farmer of the first order, found that the fleeces of the first cross between Merinos and South Downs, washed, are to the parent South Downs as six to five in weight, and as three to two in value per pound, and believes that the improvement of the wool may go on, without detriment to the carcase, until we shall obtain a breed of sheep with Spanish fleeces, and English constitutions; but this must be the result of careful and judicious selection.

6496. *Merino flocks* are now established in most districts of the empire, and but few years can elapse before their value to the farmer and the country be practically ascertained and evinced. (*See Sir J. Banks in Annals of Agriculture*, *Com. to B. of Agr.* *Bath Society's Papers*, *Dublin Society's Transactions*, *The Farmer's Magazine*, *Farmer's Journal*. Lord Somerville's, and Dr. Parry's *Tracts on Wool and Merinos*, and, various other works.)

SECT. VIII. *Of the Anatomy and Physiology of Sheep.*

6197. The general structure of the sheep resembles that of the ox very intimately. Sheep however, like the ox, experience considerable variations in size, form, and qualities; resulting from the physical and moral agencies which they become exposed to, under various climates: and also, as whether fostered by cultivation, or left to the natural operations around them. These circumstances have operated on even the bony base of the machine, as we see in the formations of the three horned breed (*Ovis polycerta*, Lin.), natives of the north; in the spiral horned (*O. strepsiceros*, Lin.), which inhabit Wallachia; and the long horned (*Capra ammon*, Lin.), which are found in the countries bordering the Mediterranean: and which have been thought to be the parents of the present cultivated British sheep. Cultivation weakens the otherwise inherent aptitude to retain the original stamp of nature; and we find therefore, that by these means, the original form of the sheep has submitted to vast alterations. We see some of them wholly without horns; we also find that the bony structure is otherwise subjected to our command, by becoming much more slender, though more compact. Accidents are also laid hold on by man to produce particular forms: thus a breed has been cultivated in America, called the ancon or otter breed, remarkable for crooked and deformed legs; which, by continued breeding from specimens that presented this originally accidental deformity, is become now a fixed and permanent breed, valuable for their incapacity to wander or climb. (*Dwight*.) The dunky or wry-faced breed, is another instance of accidental deformity cultivated into a permanent variety: as the monstrous rump of the Tartarian sheep, and the over-grown tails of some breeds in Turkey, are similar instances in the softer parts of the body.

6498. The skeleton of the sheep presents an assemblage of bones, which bears a general resemblance to that of the ox in number and direction. Like him, the head naturally is surmounted by horns springing from the frontal bones. Like him, his frontal sinuses are large and open, and thus liable to the entrance of insects. The skull bones are wide and extended; his orbits are more lateral than central; and his facial angle is about 30 degrees. His vertebral column is the same as the ox, and his ribs also. The extremities descend on the same construction, ending in a divided hoof.

6499. The visceral and soft parts are but little dissimilar likewise. His brain is as one two hundredth to the whole body; and his cerebellum to the brain generally, as 1 to 5. The pigment of the eye is of a pale yellowish green, varying occasionally to a blue. The viscera of the chest correspond with the ox; and those of the belly also, the stomachs being the same, and the economy of rumination not differing. The liver, pancreas, and spleen are similar. The penis is taper, vesiculae seminales wanting, and prostates two.

6500. The wool of the sheep is but a crisped hair; and indeed in some foreign varieties, the outer covering is of long hair like that of oxen; while in others the hair and wool are mixed.

SECT. IX. *The Diseases of Sheep.*

6501. The diseases of sheep are numerous; for these animals are now so highly cultivated that they may be regarded in some respects as artificial machines: and thus, as a natural consequence, they are subjected to a variety of artificial defects or maladies.

6502. The rot is a popular term among shepherds, and includes within its range diseases widely different. We shall not therefore follow the custom of treating the different rots of sheep together; but we shall allow them to fall in their natural order, according to the plan pursued with the diseases of oxen.

6503. The inflammatory and putrid fever, popularly known by the names *higham striking*, or *blood striking*, does not differ materially from the same disease in oxen and cows; and is in sheep also sometimes epidemic; appearing by panting, dulness, watery mucus from the nose and eyes; and great redness of all such parts as are usually white.

6504. The red water. The inflammatory fever sometimes resolves itself into an universal secretion of serum throughout all the cavities; in which case after a few days, the lymph tinged with blood will come away from the nose and mouth in large quantities. Sometimes after death the bloody serum is found suffused throughout the skin as in the blood striking of skina.

6505. The clausen or sheep pox is also another variety of this disease, in which it takes on a pustular form. About the third day small variolæ appear: sometimes they are rather blotches than pustules. The weakness is usually extreme, and the putridity great. This form of the disease is seldom seen with us; but is still known on the continent, where the pastures are very poor and low, and the general keep meagre.

6506. The treatment of all these in no wise differs from that directed under the inflammatory putrid fever of the ox. The doses of medicines being about a third of what is directed for them.

6507. Malignant epidemic or murrain. Sometimes an epidemic prevails, which greatly resembles the murrain of oxen: in appearances termination and treatment it resembles malignant epidemic of oxen. (6249.)

6508. *Peripneumonia or inflamed lungs, rising of the lights, glanderous rot, hose, &c.* These terms are all modifications of an inflamed state of the viscera of the chest, caught by undue exposure, bad pasturage, and often from over-driving. The cough, the tremblings, the redness of the eyes and nostrils, and the distillation of a fluid from them, with the heavings and hot breath, are all similar to those which characterise the pneumonia or rising of the lights in oxen. We remember to have seen the disease strongly marked in the February of 1808, on a farm in the neighborhood of Streatham; where eleven sheep were attacked almost together, after a very stormy night. They were first affected with a loss of appetite; next with a fixed staid look, which was common to every one. After this, they reeled about, fell backwards, and became convulsed. When seen, five were already dead, whose internal appearances fully confirmed the nature of the disease. The rest recovered by bleeding and drenching, with drenches composed of nitre and tartar emetic. Sometimes, the symptoms of pneumonia do not kill immediately, but degenerate into an ulceration of the lungs; which is then called the *glanderous rot*. This stage is always fatal: the others may, by early attention, be combated by judicious treatment, as detailed under the same disease in oxen.

6509. A chronic cough in sheep, when not symptomatic of rot, is always cured by a change of pasturage, particularly into a salt marsh.

6510. *Inflammation of the stomach* occurs from various causes. A common one arises from eating noxious vegetables; and produces the affections termed *tremblings*. It also produces the *grass ill* in lambs; which latter is always accompanied with black, fetid fæces, and is readily removed by an ounce of castor oil; while the former usually yields to half an ounce of oil of turpentine, beaten up with the yolk of an egg. Some herbs (as *Atropa belladonna*), when eaten produce spasmodic affections, which are called by shepherds the *leaping ill*: in such cases the watery solution of aloes (*Vet. Pharm.* 5916.) in doses of two or three ounces is useful. Daffy's elixir we have also known to be given with good effect.

6511. *The hove, blast, or wind colic*. Sheep are as liable to be distended with an enormous collection within the maw as oxen. An instrument, similar to that invented by Dr. Monro, is also made for them; and when not relieved by these means, the same remedies are applicable, as are directed for oxen. (8259.)

6512. *A wind colic* will also sometimes affect sheep more from the quality than the quantity of what they eat; it is best relieved by an ounce of castor or salad oil with an ounce of gin.

6513. *Inflamed liver, blood rot, or hot yellows*, are liver affections, arising from fever settling in that organ; or from obstructed bile irritating it. Sometimes there are great marks of fever; and at others more of putridity; according to which, treat as may be gathered from ox pathology.

6514. *Jaundice* also now and then occurs, when refer to that disease in oxen. (6338.)

6515. *Dysentery, gall scour, braxy*, are all affections brought on by sudden changes of temperature, or of undue moisture acting with cold pasturage. It is often seen in sultry autumns:—treat as under ox braxy. (6367.)

6516. *Scouring* is the diarrhoea of sheep, and in very hot weather soon carries them off. It should be early attended to, by abstracting the affected, and housing them. The *treatment* is seen under diarrhoea of oxen (6338.), which it closely resembles.

6517. *Pinning, tag-belt, break-share*. The two former are only the adhesion of the tail to the wool, and the excoriation brought on by diarrhoea; the latter is the diarrhoea itself, known to some by this term.

6518. The *rot in sheep* is also called *great rot*, and *hydropic rot*, &c.; but it is more popularly known by the single term of *rot*. Many causes have been assigned for it, as the *fasciola hepatica*, or fluke worm; some particular plants eaten as food; ground eating; snails, and other ingesta: but, as most of the supposed deleterious herbs have been tried by way of experiment, and have failed to produce the disease, so it is attributable to some other cause. Neither is there reason to suppose that the fluke worm occasions it, since we know that the biliary vessels of other animals, as horses, asses, rats, &c., often have them: and above all, because that they are not always present in the rotted subject. From long experience, and the almost invariable effect produced by a humid state of atmosphere, soil, and product; we are warranted in concluding these are the actual and immediate agents: perhaps the saturated food itself is sufficient to do it. The morning dew has been supposed equal to it. Bakewell, when his sheep were past service, used to rot them purposely, that they might not pass into other hands. This he always readily did by overflowing his pastures. But great differences of opinion exist as to the quantity, form, and varieties of moisture, productive of this fatal disease. It is said that land on which water flows, but does not stagnate, will not rot, however moist: but this is contradicted by the experience of Bakewell, who used merely to flood his lands a few times only to rot his sheep. It is also said that they are safe from rot on Irish bogs, salt marshes, and spring flooded meadows, which experience seems to verify. It is also said, that the very hay made from unsound land will rot; but this wants confirmation. When salt marshes are found injurious it is only in such years when the rain has saturated, or rather super-saturated such marshes. That putrid exhalations unaccompanied with moisture can occasion rot wants confirmation also: for these commonly go together, and it is difficult to separate their effects. It is not, perhaps, the actual quantity of water immediately received by land, but the capacity of that land to retain the moisture, which makes it particularly of a rotting quality.

6519. The *signs of rottenness* are sufficiently familiar to persons about sheep. They first lose flesh, and what remains is flabby and pale; they lose also their vivacity. The naked parts, as the lips, tongue, &c., look livid, and are alternately hot and cold in the advanced stages. The eyes look sad and glassy, the breath is fetid, the urine small in quantity and high-colored; and the bowels are at one time costive, and at another affected with a black purging. The pelt will come off on the slightest pull in almost all cases. The disease has different degrees of rapidity, but is always fatal at last. This difference in degree occasions some rotted sheep to thrive well under its progress to a certain stage, when they suddenly fall off, and the disease pursues the same course with the rest. Some graziers know this crisis of declension, as it has been called, and kill their sheep for market at the immediate nick of time with no loss. In these cases, no signs of the disease are to be traced by ordinary inspectors, but the existence of the flukes, and still more, a certain state of liver and of its secretions, are characteristic marks to the wary and experienced.

6520. The *treatment of rot* is seldom successful unless when it is early commenced, or when of a mild nature; a total change of food is the first indication, and of that to a dry wholesome kind: all the farina are good, as the meals of wheat, barley, oats, pease, beans, &c. Carrots have done good mixed with these: broom, burnet, elder, and mellilot, as diuretics, have also been recommended; but it is necessary to observe, that there is seldom any ventral effusion but in the latter stages of the complaint. As long as the liver is not wholly disorganized, the cure may be hoped by a simple removal of the

cause, which has been shown to be a variable temperature, with excessive moisture of pasturage, which may also be aided by such remedies as assist the action of the biliary system; salt acts in this way, and thus salt mashies are good; salt may also be given in the water. Salt appears the principal ingredient in Flesh's patent restorative for sheep, for it states it to be composed of turpentine, sal ammoniac, turmeric, quicksilver, brimstone, salt, opium, alkanet root, bark, antimony, camphor, and distilled water; but of this medley, none of the articles can be in sufficient quantity to prove useful, but the salt. In the more advanced stages of the disease, when the liver has become materially affected, it is prudent to rub the bellies of each sheep with half a drachm of mercurial ointment every other day for a week: give also the following, every morning: watery tincture of aloes, half an ounce, decoction of willow bark, four ounces, nitric acid, twenty-five drops.

6521. *The poit rot, hunger rot, or naked disease*, is a variety of the former, but with this difference, that whereas the liver in the hydropic rot is principally affected; in this the whole of the chylipoietic viscera are injured; the mesenteric glands are always swollen and obstructed, and from thence arises the emaciation and unhealthy state of all the secretions, by which the rot becomes incapable of receiving nutriment, and falls off, leaving the body bare, and in the last stages the teeth and horns also loosen. Indifferent, unhealthy keep, is a very common cause of this malady, and a contrary course of feeding is the best remedy when the disease has not gone on too long.

6522. *The scab, shab, ray, or rubbers*, are sometimes erysipelatous eruptions, and sometimes they are pueric or mangy ones. In the former instance they are universal and very red, occasioning a great heat and itching, and are thence called the *rubbers*: in such cases, nitre administered quickly relieves, with change of food. The eruptive scab is seldom cured without an external application; either of those directed for mange, lowered to ~~the~~ the strength, will relieve it at once. (See *Vet. Pharm.*)

6523. *Foot rot* sheep have a secretory outlet between the claws peculiar to them, which is liable to become obstructed; their feet are also liable to become injured, and then diseased, from travelling or continued standing on wet soils: but the real foot rot is an endemic affection which sometimes attacks half of the flock. It must be attended to by removing all diseased portions, and then dressing with the thrush paste, or foot rot application, (*Vet. Pharm.* 5835.), and afterwards wrapping up from external exposure.

6524. *Staggers, gid, turnsick, goggles, worm under the horn, sturdy, watery head, and pendro*, are all popular terms for hydatids, or an animal now known as the *taenia globulus*, which, by some unaccountable means, finds its way to the brain, and settles itself there either in some of its ventricles, or more frequently on its substance. Their size varies from the smallest speck to that of a pigeon egg, and the sheep it attacks are usually under two years old. These animals are likewise occasionally found in all the natural cavities of the body.

6525. *The appearances of cerebral hydatids* are, stupidity, a disposition to sit on the rump, to turn to one side, and to incline the head to the same while at rest. The eyes glare, and from oval, the pupils become round. An accurate examination will now usually discover some softness at a particular part of the skull, generally on the contrary side to that on which the animal hangs the head: when no softness of the skull is discernible, the hydatid usually exists in some of the ventricles, and the destruction of the sheep is certain and quick, from the greater disturbance to the functions of the brain; but when it is situated on the surface, it sometimes requires many months to destroy; an absorption of the bone taking place as the hydatid increases, which produces the thinness in the skull opposite to the affected part.

6526. *This disease is not incurable*, as has been supposed, but it is only relieved by a manual operation. In France it has been successfully treated by the application of the actual cautery: a pointed iron, heated red hot, is forced through the skin and skull, to the surface of the brain; the principal nicety of which, is in penetrating the hydatid with the hot iron without wounding the brain itself. In England, some shepherds are very dexterous in *wiring*, which they do by thrusting a wire up the nostril till it rests against the skull. In the passage of the wire, the hydatid is usually ruptured; others elevate the skull (by means of a trephine, or even a knife) opposite to the softened portion, and extract the hydatid, if possible, whole, which a little care will effect, by drawing it away with a blunt pincer, gently moving it from side to side. Tapping is merely letting out the fluid contents of the hydatid by an awl, which is practised by some shepherds with success; and if the instrument be not thrust too far, the animal is never injured: to avoid which, it is passed obliquely. A well hardened gimlet is a very proper instrument, with which the skull is easily penetrated, and an opening by the twisting of the instrument is made, sufficiently large in the hydatid itself, to discharge its contents, which is all that is sufficient to ensure its destruction, and which, if no others exist, is followed by immediate recovery.

6527. *Frontal worms*. Sheep are observed to gather together, with their noses thrust inwards to avoid the attack of the *oestrus ovis*, or fly, that lays its eggs on the inner margin of the nose, which, having become hatched, the larva creep up into the frontal and maxillary sinuses, to the torment of the sheep. The continental shepherds trepan an opening into these cavities, and effect their removal; but our shepherds have not succeeded in the operation.

6528. *Phake worms* are a parasitic animal, found in the biliary sinuses, not only of the sheep, but of the horse, ass, goat, deer, &c., and whose existence is rather a consequence than a cause of morbidity.

6529. *The diseases of lambs* are confined to indigestion, and eruption of secretive matter: the former shews itself in colic, which is relieved as in sheep, and also by diarrhoea, to be likewise cured by the means detailed for them; the latter is more obstinate, and begins on the rump, gradually extending along the chine, and when it becomes more universal, it usually destroys. The cure consists in giving daily drinks of half a drachm of cream of tartar, and one drachm of sulphur, in four ounces of chamomile decoction. Anoint also with mild mercurial ointment and Turner's cerate in equal quantities.

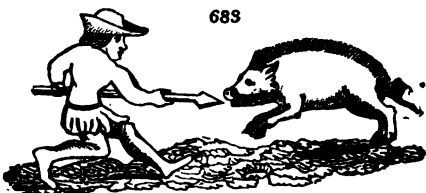
CHAP. VII.

The Swine. — *Sus Scrofa*, L.; *Cochon*, Fr.; *Schwein*, Ger.; *Puerco*, Span. and *Porco*, Ital.

6530. *Of swine* there are several species, but none in general domestication, or much used as food when taken wild, excepting the common sort, which includes the wild hog or wild boar, the original stock of our domestic breed, the European hog, and the Chinese hog. The common hog is found either in a wild or domestic state, in almost

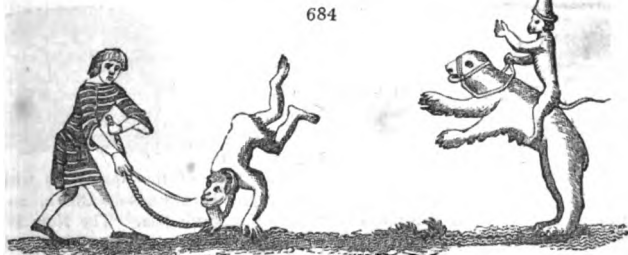
all the temperate parts of Europe and Asia ; but it is not met with in the most northern parts of these continents. It is found in many parts of Africa. Mr. Pennant asserts, that the wild boar was formerly a native of this country, and hunted from the middle of November to the beginning of December ; and it is asserted by Fitz-Stephens, that the vast forest which in his time grew on the north side of London, was the retreat of stags, wild-boars, and bulls.

6531. *The wild-boar* (fig. 683.) inhabits woods, living on various kinds of vegetables, such as roots, masts, acorns, &c. It also occasionally devours animal food : it is in general considerably smaller than the domestic hog, and is of a dark brindly-grey color, sometimes blackish ; but when only a year or two old, it is of a pale



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red or dull yellowish-brown cast ; and when quite young, it is marked with alternate dusky and pale stripes, disposed longitudinally on each side the body. Between the bristles, next the skin, is a finer or softer hair, of a woolly or curling nature. The snout is somewhat longer in proportion than that of the domestic animal ; but the principal difference is in the superior length and size of the tusks, which are often several inches long, and capable of inflicting the most severe and fatal wounds. The hunting of the wild boar forms one of the principal amusements of the great in some parts of Germany. Poland, &c. and is a chase of some difficulty and danger, not on account of the swiftness, but the ferocity of the animal. Wild boars, according to Buffon, which have not passed the third year, are called by the hunters beasts of company, because previous to that age they do not separate, but follow their common parent. They never wander alone till they have acquired sufficient strength to resist the attacks of the wolf. These animals, when they have young, form themselves into flocks, and it is upon this alone that their safety depends. When attacked, the largest and strongest front the enemy, and by pressing all round against the weaker, force them into the centre. Tamed bears have afforded subjects of barbarous sport in most parts of Europe, from the earliest period, and though bear baiting is happily no longer in vogue in Britain, as it still is in Spain ; yet the animal is taught various ludicrous movements, which are exhibited to the country people, by itinerant showmen. When real bears cannot be got, boys are metamorphosed and taught to imitate them. (fig. 684.)



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6532. *Of the tame hog*, white is the most general color ; but other colors are often intermixed in various proportions. In some respects, the hog seems to form an intermediate link between the whole and the cloven-footed animals ; in others, he seems to occupy the same rank between the cloven-footed and digitated. Destitute of horns ; furnished with teeth in both jaws ; with only one stomach ; incapable of ruminating ; and producing at one birth a numerous progeny : the union of these faculties confers on the hog a remarkable peculiarity of character. He does not, like other animals, shed his fore-teeth, and put forth a second set, but retains his first set through life.

6533. *Hogs seem to enjoy none of the powers of sensation in eminent perfection.* They are said to hear distant sounds ; and the wild boar distinguishes the scent of the hunter and his dogs, long before they can approach him. But so imperfect is their feeling, that they suffer mice to burrow in the fat of their backs without discovering any uneasiness, or appearing even to notice it. In their taste they show a singular degree of caprice. In the choice of herbs they are more delicate than any other herbiferous animal, yet devour the most nauseous and putrid carrion with more voracity than any beast of prey. At times they do not scruple to eat their own young ; they will even mangle infants out of desperate voracity.

6534. *Hogs are remarkable for the smallness of their eyes* : hence a person whose eyes are very diminutive, and deep sunk in his head, is said to be pig-eyed. The form of the hog is inelegant, and his carriage is equally mean as his manners. His unwieldy shape renders him no less incapable of swiftness and sprightliness, than he is of gracefulness of motion. His appearance is always drowsy and stupid. He delights to bask in the sun, and to wallow in the mire. An approaching storm seems to affect his feelings in a very singular manner. On such an occasion, he runs about in a frantic state, and utters loud shrieks of horror. Hogs are infested with lice, and are subject to many disorders, such as the scurvy, scab, and scrofula. The sow brings forth in the beginning of the fifth month after conception, and she has often two litters in a year. She generally produces a numerous progeny at a birth ; but her first litter is less numerous than those that follow. Hogs, when suffered to see the natural term of life, live from fifteen to thirty years. Their size and strength continue to improve till they are five or six years old.

6535. *Tame hogs are often very troublesome* in cultivated grounds, ploughing them up with their snouts, and thus entirely frustrating the labors of the agriculturist. Worms, the wild carrot, and other roots, are the objects of their search. The wild boar having a longer and stronger snout than the domestic variety, digs deeper, and continues his furrow nearly in a straight line. The inhabitants of America find the hog very beneficial in clearing their lands of rattlesnakes and other serpents, upon which he constantly preys, without apparently suffering any injury.

6536. *The hog is, in a very considerable degree, beneficial to mankind.* His flesh is pleasant, substantial, and nutritious. It affords numberless materials for the table of the epicure; among these is brawn, which seems peculiar to England. Pork takes salt better than the flesh of any animal, and is, in consequence, preserved longer, and always makes an important article in naval stores. The lard of the hog is essential to the cook and confectioner; it is used in various medical preparations, and is compounded by the perfumer into pomatums. The bristles are made into brushes, and are, moreover, of great use to the shoemaker. The skin is worked into coverings for pocket-books, and other articles.

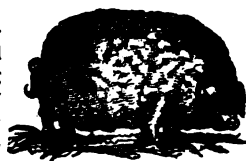
6537. *The hog in British farming* is in general viewed as a subordinate species of live stock, and chiefly valuable as consuming what would otherwise be lost. There are, however, swine husbandmen who keep large herds to advantage, especially millers, brewers, distillers, and dairymen, to whom they are an object of importance; and return, for the offal they consume, a greater weight of meat, according to some double the weight, than could be obtained from cattle. In those parts where potatoes are raised as a fallow crop, much beyond the demand for them as human food; as is the case in particular in Ireland, and the west of Scotland, the rearing and feeding of swine, the most of them sent to a distance in the state of bacon and pickled pork, is a branch of management on which great dependence is placed for the payment of their rents and other charges. The prolific nature of this animal, however, rendering it so easy to increase the supply beyond the demand, the price of swine flesh varies more than that of any other sort of butcher's meat, and their culture can never be so much depended on by the general farmer as that of cattle or sheep. A writer in the *Farmer's Magazine* observes, that the swine are the only variety of granivorous animals that can be fed upon the offal of grain, or such articles as would otherwise go to waste about a farm-stead. Since the erection of threshing machines, a much greater quantity of light grain is beat from the straw, than was gained when the flail was employed. To use this extra quantity to advantage becomes an important concern to the occupiers of land; and this writer thinks that the using of it in raising and supporting swine is by far the most profitable mode of consuming an article, which, in other respects, is comparatively of little value.

SECT. I. Of the Varieties of the common Hog.

6538. *The domesticated European variety of the common hog (fig. 685.) is too well known to require any description.*



6539. *The Chinese hog (fig. 686.) is distinguished from the common, by having the upper part of its body almost bare, its belly hanging nearly to the ground; its legs are very short, and*

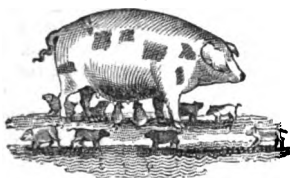


its tail still more disproportionately short. The flesh of this variety is whiter and more delicate. The color is commonly a dark grey. It abounds in China, and is diffused through New Guinea, and many islands in the South Sea. The New Hebrides, the Marquesas, the Friendly and the Society Islands, possess this animal, and cultivate it with great care, as it is almost the only domestic animal of which they can boast. The varieties of hog cultivated in Britain, are partly the result of climate and keep in the European variety, and partly the effects of crossing with the Chinese. At the same time, it is only in particular districts that so much attention has been paid to this animal, as to give rise to any accurate distinction of breeds; and nowhere has it received any considerable portion of that care in breeding, which has been so advantageously employed on the other animals of which we have treated. Yet, among none of the varieties of those is there so great a difference as among the breeds of this species, in regard to the meat they return for the consumption of a given quantity of food. Some races can with difficulty be made fat, even at an advanced age, though fed from the trough with abundance of such food as would fatten any other animal; while others contrive to raise a valuable carcase out of materials on which no other creature could subsist.

6540. *The Chinese race, according to Culley, has been subdivided into seven varieties or more; and it would be easy to point out twice the number of as prominent distinctions among the sorts in the third class.* But such an affliction of accuracy is as useless as it would be tedious. One general form, approaching to that of other animals kept for their carcase, ought certainly to be preferred; and the one, which is the other distinguishing characteristic, must be chosen with a view to the food provided for their maintenance, and not because it is possible to raise the individuals to a great, and probably, unprofitable weight. The fineness of the bone, and the broad, though also deep, form of the chest, denote in this, as in the other species, a disposition to make fat with a moderate consumption of food; and, while it may be advisable to prefer the larger breeds in those places where bacon and flitches are in most demand, the

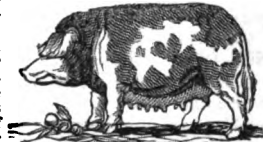
smaller breeds are most esteemed for pickling, and are, beyond all doubt, most profitable to those farmers who allow them little else than the range of the farm-yard, and the offals of the kitchen.

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6541. *The Berkshire breed* (fig. 687.) is distinguished by being in general of a tawny, white, or reddish color; spotted with black; large ears hanging over the eyes; thick, close, and well made in the body; legs short; small in the bone; having a disposition to fatten quickly; and when well fed, the flesh is fine. Berkshire has been long famous for its breed of swine, which, as it now stands, is, in the third class, in point of size, excellent in all respects, but particularly as a cross for heavy, slow-feeding sorts. It has extended itself from the district from which it takes its name, over most parts of the island; is the sort mostly fattened at the distilleries; feeds to a great weight; is good for either pork or bacon; and is supposed by many as the most hardy, both in respect to their nature and the food on which they are fed.

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6542. *The Hampshire breed* (fig. 688.) are large, longer in the body and neck, but not of so compact a form as the Berkshire; they are mostly of a white color, or spotted, and are well disposed to fatten, coming up to a great weight when properly managed in respect to food. Lawrence says they are generally dark spotted, some black, of a longer and flatter make than those of Berks, ears more pointed, head long and sharp, resembling the Essex.

6543. *The Shropshire breed* is another large breed of hogs, which are found valuable where the keep is in sufficient abundance for their support. They are not so well formed as those of the Berkshire kind, or equal to them in their disposition to fatten, or to be supported on such cheap food. The standard color of this breed is white, or brindled; Shropshire has long bred stores for the supply of the London feeders, and of the Essex farmers, who thus turn their clovers to the most profitable account.

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6544. *The Gloucestershire breed* is likewise a larger breed, but inferior to either of the above, being tall and long in shape, and by no means so well formed. The color is in general white. It has two wattles hanging from the throat.

6545. *The Herefordshire breed* (fig. 689.) is also a large useful breed, but perhaps without possessing any advantage over those that have been described above.

6546. *The Rudgwick breed* is a large kind of swine, which the author of the *Survey of Middlesex* says, is the largest in the island, met with at the village of that name, on the borders of Sussex and Surrey. They feed to an extraordinary size, and weight, at two years old, nearly double or triple the usual weight of other sorts of hogs of that age. As large breeds pay the farmers best in many cases, such a breed deserves to be attended to in the system of hog management.

6547. *The large spotted Woburn breed* is a breed introduced by the late Duke of Bedford, being large in size and of various colors. It is a hard, well formed prolific sort, rising quickly to a large weight.

6548. *The Wiltshire breed* is a long-bodied, low hog, hollow about the shoulder, and high on the rump, middling large pointed ears, round bone, light in color.

6549. *Yorkshire breed*. This, in the old breed, was probably the worst large variety we had; extremely long-legged and weak-jointed, their constitution not of the soundest; and bad sty-pigs in the winter season; they were yet quicker feeders than some of the superior breeds. They have been improving some years from the Berkshire cross, but are still inferior to the north-western stock, rendering a less price at market.

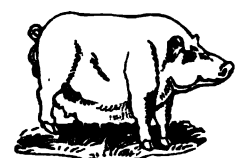
6550. *The Northamptonshire breed* was formerly a handsome, light-eared, white, deep-sided pig, with middling bone, and quick of proof: the breeders have since tried the new Leicester.

6551. *The Leicestershire breed* is, in the original stock, large, deep, and flat-sided, light-spotted, with rather handsome head and ear. The Bakewell variety has much merit.

6552. *The Lincolnshire breed* was formerly light-colored and white, like those of Northamptonshire, many of them having curled and woolly coats. They are middle-sized, quick-proving pigs.

6553. *The Norfolk breed* is, a small, short, up-eared porking sort, various in color, white, bluish, striated; generally an inferior kind, which it would be to the interest of that great corn county to improve; they are, however, of a thin-skinned, quick proving kind. But in the vicinity of Lynn, and generally on the Lincoln side of the county, there is a larger spotted variety of very good form and quality, which should be encouraged.

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6554. *Suffolk breed* (fig. 690.). This is a small delicate white pig, which has for many years had great reputation, and at this time there is not only a strong prejudice in their favor in their own county, but they have many advocates out of it. They are shorter, and more pug-formed than the Norfolks, and by their dish-face, and pendent belly, it may be supposed, that the variety proceeded originally from the white Chinese. Some of the Suffolks are very handsome, and very regularly shaped; their defects are, that they are great consumers in proportion to their small bulk, and that they produce little flesh.

6555. *The Essex breed* are up-eared, with long sharp heads, roach-backed, carcasses flat, long, and generally high upon the leg, bone not large, color white, or black and white, bare of hair, quick feeders, but great consumers, and of an unquiet disposition.

6556. *The small white English breed* is met with in many districts; it is of a white color, thick, compact, and well made in the body; short in the leg; the head and neck well formed, and the ears slouching a little downwards. It is well disposed to fatten, and perfectly hardy. It prevails much in the northern districts.

6557. *Swine-tailed breed*. This is an useful sort of the smaller kind of hogs, hardy in its nature, and of considerable weight in proportion to its size.

6558. There are many other varieties and subvarieties in England which it is unnecessary to notice here. Donaldson remarks, that the Berkshire and Hampshire hogs are the largest; but that it is most probably from the Berkshire stock, that the greatest number of the varieties of the country have sprung.

6559. Of the *Highland breeds*, that of the Hebrides, supposed by Dr. Walker to be the original, is of the smallest size, neither white nor yellow, but of a uniform grey color,

and shaggy, with long hair and bristles; they graze on the hills like sheep; their sole food is herbage and roots, and on these they live the whole year round, without shelter, and without receiving any other sustenance. In autumn, when they are in the best order, their meat is excellent, and without any artificial feeding; but when driven to the low country, they fatten readily, and rise to a considerable bulk. (*Walker's Hebrides*, vol. ii. p. 17.) In the Orkney islands they are commonly of a dark red, or nearly black color, and have long bristles, with a sort of coarse wool beneath them.

6560. *The old Irish breed* are a long legged, thin-sided, lank, haggard, unprofitable sort of swine; but where they have been crossed with the Berkshire, they are considerably improved.

Sect. II. Of Breeding and Rearing of Swine.

6561. In the breeding of swine, whatever be the variety, the most perfect and best formed boar and sow should be chosen, and a due regard paid to their age, time of copulation, period of gestation, farrowing, castrating or spaying, and weaning.

6562. In choosing the boar and sow, regard must be had to their size, as well as perfection of form. Where food is abundant, or the object of the progeny is the production of bacon and flitches, the larger breeds, as already observed, are to be preferred: but where food is scarce or uncertain, as in the case of the cottager's stock, or rearing for suckled pork, fresh pork, or pickled pork, the smaller breeds, as the Berkshire, are to be preferred. A breeding sow ought to have a large capacious belly, and not to be too much inclined to obesity. To check this tendency, some allow them to breed five times in two years.

6563. *The age of the boar* should not be less than a year, as he will then be at his full growth; nor that of the female less than ten months. They may be used in breeding for three or five years, and then fed off for the shambles.

6564. *The period of gestation* in swine is about four months, so that two litters may be easily produced in a year, five in two years, or ten in four years.

6565. *The best times for copulation* are November and May; because then the progeny are brought forth in mild weather, and when green food is to be had. They should not be allowed to farrow in winter, as young pigs are exceedingly tender, and can with difficulty be preserved in very cold weather; nor at a time when food is scarce, as is generally the case upon corn-farms in summer, if the stock of them is large. When the object is suckled pigs for the shambles, copulation should be so contrived as to produce parturition at all seasons.

6566. *The usual produce* is from about eight to ten or twelve pigs in the large, but more in the smaller breeds, which in general bring the greatest number, and the most early. Twenty swine are estimated to bring at an average seven pigs and a half each for their first litter; but the number varies much, and many young pigs are lost soon after their birth by the unkindness of their dam, and by casualties, to which they are more exposed than most other young animals.

6567. *The pregnant swine* should be separated from the herd some time before she is expected to farrow, carefully watched, and littered with a small quantity of dry short straw. Too much straw is improper, both at the time of farrowing, and for a week or two afterwards, as the pigs are apt to nestle beneath it unperceived by the sow, and are thus in danger of being smothered when she lies down. A breeding sow should be well fed, particularly when nursing; and it is advantageous early to accustom the pigs to feed from a low trough on milk or other liquid food, mixed with meal or bran. Such of the pigs of both sexes as are not to be kept for breeding, are usually castrated or spayed when about a month old, and the whole may be weaned at the end of six or seven weeks.

6568. *The food allowed to growing swine* depends in almost every case upon the circumstances of their owners, for, as already observed, it is a doubtful point whether swine will pay when all their food both in rearing and fattening is to be purchased. The cottager's pig must be contented with the scanty offals of his kitchen and of his dairy, the produce generally of a single cow; towards the end of autumn a few potatoes are added for the purpose of preparing it for the slaughter, and perhaps a little meal is mixed with boiled potatoes for a week or two before. Such pigs, however, often thrive amazingly, make themselves moderately fat, and form a most valuable addition to the winter stores of their owners. In the south-eastern counties of Scotland, the hinds or married ploughmen are commonly allowed to keep a pig each, which they feed in this manner, and from which their families derive much benefit at very little expense. Near woods, acorns, mast, and other seeds, as well as some roots and vermin, afford excellent nourishment. On many corn farms, the chief, and not unfrequently, the only dependence of swine is on the straw-yards. The sweepings of the barn floor, corn left upon the straw, and oats found among the dung of horses, with a share of the turnips given to the cattle in winter, and of the clover in summer, afford ample subsistence to swine, in the proportion, perhaps, of one to every five or six acres under corn, clover, and turnips.

The kitchen and dairy give some assistance to pigs newly weaned, and also to such as are soon to be slaughtered. A great many are killed when about a year old, that have never been fed at any expense that can be estimated. A few pigs, if of a good breed, will always be moderately fat at that age with the run of the straw-yard, and their flesh is of an excellent quality.

6569. *To prevent swine from digging in the soil*, the best method is to cut the two strong tendons of their snouts with a sharp knife, about an inch and a half from the nose. This may be done with little pain, and no prejudice to the animal, when about two or three months old. The common practice of restraining them by rings fixed in the snout is painful and troublesome; they must be replaced as often as they give way, and that happens so frequently, that rings afford but little security against this nuisance.

SECT. III. Of Fattening Swine.

6570. The following system of rearing and fattening swine on an arable farm is recommended by a writer in the *Farmer's Magazine*. Upon a tillage farm consisting of three hundred acres, whereof two hundred are kept under the plough, he is of opinion that a considerable sum may be annually gained from keeping swine, were the management arranged in a systematic manner. One main advantage of such a branch of rural economy arises from little or no capital being required to carry it on, while the trouble and outlay attending it scarcely deserve notice. With the addition of one acre of broad clover, and one acre of tares, for the summer and autumn months, and the like extent of ground for turnips and yams during the winter and spring months, this stock of swine may be amply supported.

6571. *Were two breeding sows kept on a farm of the size mentioned*, and their produce reared by the farmer, it may be calculated that forty swine, weighing seven or eight stone each, would be annually fed off, in the months of January and February each year, the time when pork is most in demand. That such a number of swine can be supported and fed upon the offals of a three hundred acre farm, and the other auxiliary articles specified, may be pronounced a certain fact.

6572. *The breeds*, he recommends, are the hardy smaller sized varieties, but not the Chinese, or any of the pot-bellied sorts; because he has found that such breeds will thrive and grow fat where larger and finer breeds would starve.

6573. *The mode of management* is, that a boar and two good sows of a proper age should constantly be kept, and that one young sow shall annually be reared, in order to supply the others when they pass maturity. He would cast off the oldest sows, *i. e.* feed them when they arrive at three years of age, which, of course, would cause four sows to be in hand at one time. These annually would produce more than the forty pigs which are to be held on; but the remainder might be sold as they are weaned, there being a regular and steady demand in most parts of the country for young pigs. He has for a number of years, kept a stock of swine in the way recommended. They go at large in the court or yard belonging to the farm, and receive a feeding of offal grain in the morning, and of yams or turnips in the evening; and the meat fed in this way has constantly drawn the highest price. They get also the dish-washings of the house, any milk or whey that remains unconsumed, and have the dunghill to roam upon, where perhaps more food is to be gathered, especially if the horses are fed upon unbroken grain, than is commonly imagined. It will readily be figured, that under this mode of management, the latter end of summer and the harvest months is the critical period for carrying on a stock of swine. During these months little threshing goes forward, and horses seldom receive any corn for aliment; hence all that can be consistently attempted is to keep the animals in a growing state, and prepare them for fattening cleverly, when food of a more nutritious quality can be procured. Clover and tares will do this effectually, the last particularly so when in a podded state. Turnips can also be got by the end of September; and it must be recollected, that through the summer months a considerable quantity of milk and whey can be given, upon which swine will be found to thrive heartily. He does not know a more beneficial stock upon a farm than swine, so long as the quantity kept is in proportion to the extent of offals about the premises. The other articles recommended are merely meant to render the consumption of offals more beneficial, to carry on the stock at periods when such offals are scarce. The charge of attendance is very small; indeed, the benefit gained by the dunghill will more than compensate the expenses incurred. To make as much profit from cattle or sheep requires a great advance of money; but in the article of swine hardly any is necessary, while the most part of the articles consumed cannot, in any other way, be converted to such beneficial purposes.

6574. *In fattening for bacon and flitches* the larger breeds are chosen; and in breweries, distilleries, oileries, and dairies, fed on grains, oil-cake, and milk; but where arable farmers keep swine of this description, as is the practice in some of the western counties, the method is to rear chiefly on raw potatoes and Swedish turnips, and to fatten on these roots, boiled or prepared by steam, with a mixture of oat, barley, or bean and pea meal. Their troughs should be often replenished with a small quantity of food at a time, and kept always clean; and their food changed occasionally, and seasoned with salt. If proper care be taken, says a late writer, a feeding pig should not consume more than six Winchester bushels of oats made into meal. It ought to be shelled before it is ground, the same as for family use, but need not be sifted. (*Henderson's Treatise on Swine*, p. 26.)

6575. *In fattening sucking pigs* all that is requisite is to keep the mother well lodged and nourished. Weaned pigs when to be fatted are kept constantly on whey, or skimmed or butter-milk, with frequently an addition of pease or beans, or barley-meal. Such good keeping not only makes them increase rapidly in size, but renders them fit for the butcher at an early age. Swine are sold to the butcher at different ages, and under different names; as pigs when a few weeks old; as porkers at the age of five or six months; and as full grown hogs at from eighteen months to two years old. The young pigs are commonly roasted whole; the porkers are used as fresh or pickled pork;

and the full grown hogs are for the most part converted into ham and bacon. The demand for porkers, which for London in particular is very great, and which continues almost throughout the year, is chiefly supplied from the dairies within reach of that metropolis.

SECT. IV. *Of curing Pork and Bacon.*

6576. *The curing or pickling of pork* is carried on to a considerable extent at many of our sea-ports. The carcase is cut in pieces, and packed in casks or kits, made for the purpose, containing from one to two hundred weight. Salt is dissolved in water till the mixture be strong enough to swim an egg; it is then boiled, and, when cold, poured upon the pork: when the end of the cask is fixed in, the article is ready for being sent to market. Henderson, a late writer, has given particular directions for the curing of bacon, founded upon a long course of experience, which, therefore, deserves to be more generally known.

6577. *The curing of bacon* is thus described by Henderson, after much experience. After the carcase has hung all night, lay it upon a strong table, or bench, upon its back; cut off the head close by the ears, and cut the hinder feet so far below the hough as will not disfigure the hams, and leave plenty of room to hang them by; then take a cleaving knife, and, if necessary, a hand mallet, and divide the carcase up the middle of the back bone, laying it in two equal halves: then cut the ham from the side by the second joint of the back bone, which will appear on dividing the carcase; then dress the ham, by paring a little off the flank or skinny part, so as to shape it with a half round point, clearing off any top fat that may appear; the curer will next take off the sharp edge along the back-bone with his knife and mallet, and slice off the first rib next the shoulder, where he will perceive a bloody vein, which he must take out, for if it is left in, that part is apt to spoil. The corners must be squared off where the ham was cut out.

6578. *In killing a number of swine*, what sides you may have dressed the first day, lay upon some flags or boards, piling them up across each other, and giving each pitch a powdering of saltpetre, and then covering it with salt: proceed in the same manner with the hams, by themselves, and do not omit giving them a little saltpetre, as it opens the pores of the flesh to receive the salt, and, besides, gives the ham a pleasant flavor, and makes it more juicy. Let them lie in this state about a week, then turn those on the top undermost, giving them a fresh salting: after lying two or three weeks longer, they may be hung up to dry in some chimney, or smoke house; or, if the curer chooses, he may turn them over again without giving them any more salt, in which state they may lie for a month or two without catching any harm, until he has convenience for drying them. Henderson practised for many years the custom of carting his fitches and hams through the country to farm houses, and used to hang them in their chimnies, and other parts of the house to dry, some seasons, to the amount of five hundred carcases: this plan he soon found was attended with a number of inconveniences, and therefore he invented a smoking house.

6579. *Henderson's smoking house* is about twelve feet square, and the walls about seven feet high: one of these huts require six joists across, one close to each wall, the other four laid asunder, at proper distances. To receive five rows of fitches, they must be laid in the top of the wall; a piece of wood strong enough to bear the weight of one fitch of bacon, must be fixed across the belly end of the fitch, by two strings, as the neck end must hang downwards: the piece of wood must be longer than the fitch is wide, so that each end may rest upon a beam; they may be put so near to each other as not to touch; the width of it will hold twenty-four fitches in a row, and there will be five rows, which will contain one hundred and twenty fitches; as many hams may be hung at the same time above the fitches contrived in the best manner we can. The lower end of the fitches will be within two, and a half or three feet of the floor, which must be covered five or six inches thick with saw-dust, and must be kindled at two different sides; it will burn, but not cause any flame to injure the bacon. The door must be kept close, and the hut must have a small hole in the roof, so that part of the smoke may ascend. That lot of bacon and hams will be ready to pack up in a hogshead, to send off in eight or ten days, or a little longer, if required, with very little loss of weight. After the bacon is salted, it may lie in the salt-house as described, until an order is received, then immediately hang it up to dry. Henderson found this smoke-house to be a great saving, not only in the expense and trouble of employing men to cart and hang it through the country, but it did not lose nearly so much weight by this process.

6580. *In the disposal of bacon*, whatever is shipped for the London market, or any other, both bacon and hams, must be packed into a sugar hogshead, or something similar, to hold about ten hundred weight. Bacon can only be cured from the middle of September, until the middle of April. (*Henderson's Treatise on Swine*, p. 39.)

SECT V. *Of the Diseases of Swine.*

6581. *Swine are subject to various diseases*, but according to Laurence, they are not easily doctored. They are subject, he says, to pox or measles, blood striking, staggers, quincy, indigestion, catarrh, peripneumonia, and inflammation of the lungs called heavings. When sick, pigs will eat, and they will take medicine in their wash; when they will not eat, there is no help for them. As aperients, cleansers, and alteratives, sulphur, antimony, and madder, are our grand specifics, and they are truly useful. As cordials and tonics, treacle and strong beer, in warm wash, and good pease and pollard. In the measles, sulphur, &c. and, if the patient require it, give cordials now and then; in staggers, bleeding, fresh air, and perhaps nitre; in catarrh, a warm bed, and warm cordial wash, and the same in quincy, or inflammation of the glands in the throat. If external suppuration appear likely, discharge the matter when ripe, and dress with tar and brandy, or balsam. The heavings or unsoundness of the lungs in pigs, like the unsoundness of the liver in lambs, is sometimes found to be hereditary; there is no remedy. This disease in pigs is often the consequence of colds from wet lodging, or of hasty feeding in a poor state; in a certain stage it is highly inflammatory, and without remedy. Uction with train oil, and the internal use of it, have been sometimes thought beneficial.

CHAP. VIII.

Of the Goat, Rabbit, Hare, Dormouse, Deer, and various other Animals, that are or may be subjected to British Agriculture.

6582. The goat, (*Capra agagrus*, L., fig. 691.) is a native of many mountainous parts of Europe, Africa, Persia, and India; he is domesticated throughout Europe, feeds on branches of shrubs, on lichens, hemlock, &c.; is seldom destitute of horns, of active habits like the deer, treacherous, petulant, roaming, and lascivious; gravid four months and a half, brings from one to two at a birth, and lives ten or twelve years. The female will allow itself to be sucked by the young of various other animals, and a foal which has lost its mother has been seen thus nourished by a goat, which, in order to facilitate the process, was placed on a barrel. The attachment between the nurse and foal appeared strong and natural: in its internal structure, it extremely resembles sheep, but is far superior to them in alertness, sentiment, and intelligence. The goat approaches man without difficulty, is won by kindness, and capable of attachment. The extremely unpleasant odor attending these animals, is supposed to be beneficial, and horses appear so much refreshed by it, that a goat is, on this account, often kept in the stables of the great. It is a singular local peculiarity, that in Angora only, the animals of the *Capra*, *Ovis*, and *Lepus* tribe, have long soft silky hair.

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6583. The *Angora goat*, a native of Turkey, is chiefly valued for its exquisitely fine hair down, which grows under its coarse hair, and of which the Cashmere shawls are manufactured. The down is obtained by gently combing them. A considerable number of this breed were imported to France from Persia, in 1819, and stationed at St. Omers, with a view to their increase, and the establishment of the shawl manufacture. The kids of this flock are said to be abundantly covered with down and hair, and superior in strength and appearance to indigenous French kids of the same age. It is a common opinion, that the down of this goat degenerates when the animals are removed from the pasturage of Angora; but this is likely in part to arise from the neglect of cleaning and washing them, which at Angora is so assiduously attended to. By a late Report of M. Terneaux to the Paris Agricultural Society, the French Angoras have increased in number, and prosper equally with the native variety.

6584. The *Syrian goat* (fig. 692.) is remarkable for its pendulous ears, and is common in various parts of the East. The animals of this variety are driven in flocks through the Oriental towns every morning and evening, and each housekeeper sees drawn from them, before her door, as much milk as she is in want of.

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6585. The *Chamois goat*, a native of Switzerland, is a species of antelope, and will be afterwards noticed.

6586. The *goats of Wales* are generally white, and are both stronger and larger than those of other hilly countries. Their flesh is much used by the inhabitants, and often dried and salted, and substituted for bacon. The skins of the kids are much valued for gloves, and were formerly employed in furniture, when painted with rich colors, of which they are particularly capable, and embellished with ornamental flowers, and works of silver and gold. The goat may be of some advantage in rocky barren countries, where nothing else can get a support for life. They will climb the steepest rocks, and there browse upon briers, heath, and shrubs of various kinds, which other creatures will not taste of. They will feed on grass in pastures; but, as they love browsing on trees much better, great care should be taken to keep them from valuable plantations.

6587. The produce of the goat, from which advantage is chiefly obtained, is the milk, which it yields in large quantities, and which is accounted the best milk of all animals. They mix this and cows' milk together in some parts of the kingdom, and a very valuable cheese is made from it. Besides this, the kids or young goats are very fine food, and the best kinds bring forth two or three at a time, and that twice a year.

6588. Goat's hair is also valuable; it may be sheared as the wool from sheep, and is excellent for making ropes that are to be used in the water, as they will last a great while longer than those made in the common way. A sort of stuff is also made of it in some places.

6588. *The skin of the goat is also in great esteem, and many of the inhabitants of Caernarvonshire kill them merely for the sake of their fat, which makes candles of a superior quality to the common. Of their horns excellent handles are made for tucks and pen-knives. The skin is peculiarly well adapted for the glove manufactory, especially that of the kid; as it takes a dye better than any other skin. The old skin is also of great use, being preferred to that of the sheep, and the flesh affords a cheap and plentiful provision in the winter months, particularly when the kids are brought to market. The haunches of the goat are frequently salted and dried, and supply all the uses of bacon: this by the Welsh is called *coch yr wlen*, or hung venison.*

6590. *The kind of goats for keeping to advantage should be chosen in this manner: the male should have a large body, his hair should be long, and his legs straight and stiff; the neck should be plain and short, the head small and slender, the horns large, the eyes prominent, and the beard long. The female should have a large udder, with large teats, and no horns, or very small ones. Goats should be kept in flocks, that they may not straggle; and they should have good shelter both in summer and in winter, the heat and cold being both prejudicial to them, and coupled in December. They should have no litter in winter, but only a paved floor kept clean. The kids are to be brought up for the table in the same manner as our lambs are.*

6591. *The rabbit (*Lepus cuniculus*, L., fig. 693.), is indigenous in most temperate climates, but not so far to the north as the hare. In a wild state it forms long-winding burrows; keeps its hole by day; feeds morning, evening, and night on vegetables and grain; is the prey of hawks, badgers, polecats, and caught by ferrets; gravid thirty days, brings from four to eight young seven times a year. The varieties common in Britain are the white, black, variegated, and silvery grey. The hare and rabbit are distinguished from each other externally, chiefly by the proportional length of the hind legs to that of the back, and in the ears of the hare being longer, and those of the rabbit shorter than the head. The haunts of rabbits are called warrens; which are most numerous in the sandy soils of Norfolk and Cambridgeshire. They sometimes extend to 2000 or 3000 acres, and many have been hitherto considered to pay better in that state than in any other. Arthur Young, however, has shown in his *Survey of Lincolnshire*, that though a rabbit-warren may afford a high interest on the capital of the occupier, yet the rent it affords to the owner of the soil is less than would ultimately be obtained by planting or breaking up, and laying down with chicory or some other suitable herbage plant. In the meantime, as they continue to exist, and are subjected to a kind of management, we shall submit a short outline of it under the heads of extent, soil and situation, fencing, stocking, breeding, rearing, and produce. Afterwards we shall take a view of the mode of managing rabbits in hutches.*

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6592. *The extent of warrens varies from 100 to 3000 acres, but a convenient size is considered to be 1500 or 2000 acres. The soil and situation should be dry, sandy, warm, and poor; rich grass or herbage being found to produce a scouring, which sometimes carries off the greater part of the stock. Warrens are generally inclosed with walls either of stone or turf, an essential addition to the latter being a coping of furze, reeds, or stiff straw. Paling is used in some places, but a brook is found insufficient, as the rabbits have been found to swim across.*

6593. *Warrens are often stocked by nature, and all that art has to do in that case is to protect the produce; but in some cases they are formed on ground where rabbits do not exist naturally, or where they exist it is considered desirable to change the breed.*

6594. *In stocking a warren, whether the surface be flat or hilly, artificial burrows are sometimes made, to reconcile the rabbits to the ground, and to preserve them from vermin, until they have time to make their own burrows. These are bored with an auger of a diameter large enough to make a burrow of a sufficient width. In a level warren, these augers may, from time to time, be found useful in forming such holes. They, however, in most cases, are capable of making burrows for themselves. Some warren lands are stocked in the proportion of three couple to an acre; while in others it is in a considerably larger proportion. In Lincolnshire, one buck or male rabbit is said to be sufficient for one hundred does, or females; but this is certainly a much larger proportion, than in most other districts. On the wild warrens of Yorkshire, according to Marshal, one male is considered sufficient for only six or seven females, and the nearer they can be brought to that proportion the greater the stock of young ones that may be expected, it being the nature or economy of the males to destroy their young, especially when the proportional number is too great.*

6595. *The varieties employed as stock for warrens are the common grey and silver grey breeds. The former of which is found to be considerably more hardy and much better for the purposes of food; but the latter has greatly the advantage in the value of the skin. Till lately the common grey rabbit, probably the native wild rabbit of the island, was the only species. At present, the silver-haired rabbit is sought after and has, within the last few years, been introduced into most warrens. The skin of the grey rabbit is cut; that is, the wool is pared off the pelt, as a material of hats: whereas, that of the silver-haired rabbit is dressed as fur; which, it is said, goes principally to the East Indies. The color is a black ground, thickly interspersed with single white hairs. The skins of this variety sell for about four shillings a dozen more than those of the common sort; a sufficient inducement for propagating it in preference to the grey breed.*

6596. *The rabbit begins to breed at an early age, as at eight, ten, or twelve months, going only about thirty days with young, the young being little more than three weeks old before they appear from the burrows, during which time they are suckled twice in the day by the mother. It is therefore evident, that they may breed three or four times in the course of the year under good keep, as the does take the buck almost immediately after producing their young. In warrens that are inclosed, it is, however, said that they seldom breed more than two or three times in the year.*

6597. *The management of a rabbit warren is a very simple business. Birds and beasts of prey are to be kept off by taking them in traps; dogs and cats kept off, and rats, moles, mice, and other vermin destroyed if abundant or troublesome. Man himself is to be guarded against in some situations. Additional food is to be supplied in the winter season, when the weather is severe, such as fine green hay, taintoin, clover*

turnips, and others of the same sort, which must be distributed over the warrens. It is supposed that turnips answer the best in deep snows, as the rabbits can discover them by the scent. This sort of food is given in the quantity of two or three large cartfuls to a thousand couple per day, and one load of hay in the same time during a storm. It is likewise sometimes the practice to distribute billets of new cut ash-boughs, gorse or whins, and other similar woods in the warrens, the bark and other parts of which is eaten, by which the proportion of hay is lessened in a considerable degree. In great snows it is necessary to clear it away from the ditches or fences to prevent the rabbits from getting over them.

6598. This sort of stock is mostly taken by nets or traps, set in the form of a fold between the places where they run, and those where they feed, the rabbits being hunted into them as they return from feeding. Sometimes they are taken by ferrets and terriers. The wold warreners, Marshal says, have three ways of catching their rabbits: with fold nets; with spring nets; and with types, a species of trap. The fold nets are set about midnight, between the burrows and the feeding grounds; the rabbits being driven in with dogs, and kept inclosed in the fold, until morning. But the spring net, when used, is, he believes, generally laid round a hay stack, or other place, where rabbits collect in numbers. It is added that the trap is a more modern invention. It consists of a large pit or cistern, formed within the ground, and covered with a floor: or with one large falling door, having a small trap-door towards its centre, into which the rabbits are led by a narrow mouth. This trap on its first introduction, was set mostly by a hay-stack; hay being, at that time, the chief winter food of rabbits; or on the outside of the warren wall, where rabbits were observed to scratch much, in order to make their escape. Since the cultivation of turnips, as a winter food for this species of stock, has become a practice, the situation of the trap has, he says, been changed. Turnips being cultivated in an enclosure within the warren, a trap is placed within the wall of this enclosure. For a night or two, the mouth is left open, and the trap kept covered, (with a board or triangular rail), in order to give the rabbits leave to retreat.

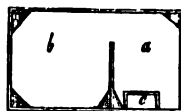
6599. The annual produce per acre, is mostly estimated at from three or four, to eight or ten couple, yielding a profit of from eight to ten, or even fifteen shillings; where they are conducted under a good system of management. The produce is the largest on new lands; however, much of the profit must always depend on situation, so as to be near good markets. These animals are in what is termed season from the end of October to the beginning of January, in which period the best skins are produced, of course a large proportion of them is killed in this short time. The farmer often sustains great loss in what by the purchasers are called half skins, quarter skins and racks, sixteen of which are only considered as a whole skin. The rabbits are disposed of by the hundred, six score couple being considered as an hundred.

6600. The breeding and rearing of tame rabbits is carried on in hutches or stores of boxes placed in sheds or apartments of any kind secure from vermin. We shall give a view of the practice as to rabbitry and furniture, varieties, breeding, feeding, and produce.

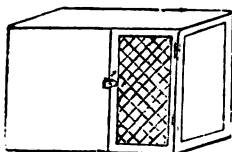
6601. The rabbit house, should be particularly dry and well ventilated, as these quadrupeds are very subject to the rot, and to liver complaints like sheep.

6602. The *huts or hutches*, (Fig. 654.) are boxes or chests eighteen inches or more high, and from two and a half to three feet wide, generally divided in two (a and b), and the rooms thus formed communicating by a sliding door, the use of which is to confine the rabbits in the inner division (a), whilst the outer, which has a wire door, (Fig. 655.) is cleaned. Generally these hutches are placed in rows above each other against one side of the rabbit-house, and sometimes they are placed in the open air, against a wall within a wired or netted enclosure. Sometimes they are ranged along the floor; but the neatest mode is to place them on brackets round the room, or on stands about three feet high on the floor. In both these cases it is to be understood that they are not allowed to run about the rabbit room, the use of which is solely to enclose and protect them in an atmosphere of moderate temperature, and to contain a bin with corn, a truss of clover, hay, and any such food as sheep will live and thrive upon. The utensil for feeding rabbits so hutched is simply a trough (c), which may be formed of pewter, very hard wood, earthenware, or cast iron, as rabbits are very apt to gnaw them; and it should

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be divided on the surface cross ways every four or six inches to prevent them from scratching and throwing out their corn. Some add a small rack for their clover, but that will not be lost if given on the floor in small quantities.

6603. There are numerous varieties of tame rabbits; but the broad-chested and short-legged are the most hardy, and fatten most expeditiously. There is a large variety of the hare color, which has high colored and high flavored flesh, more savoury than that of the common rabbit; they make a good dish cooked like the hare, which at six or eight months old they nearly equal in size. The large white, and yellow and white species, have whiter and more delicate flesh, and, cooked in the same way, will rival the turkey. The Turkish or French rabbit is esteemed by some, but differs little from the common variety. All these and other varieties are to be had from the London dealers and poultrymen.

6604. *Breeding.* The doe will breed at the age of six months; and her period of gestation is thirty or thirty-one days. It should be premised, that the buck and doe are by no means to be left together; but their union having been successful, the buck must be immediately withdrawn, and the doe tried again in three days: in fact, with rabbits, this business is conducted on the same principle as in the stud. Like chickens, the best breeding rabbits are those kindled in March. Some days before parturition, or kindling, hay is to be given to the doe, to assist in making her bed, with the sue, which nature has instructed her to tear from her body for that purpose. She will be at this period seen sitting upon her haunches, and tearing off the sue, and the hay being presented to her, she will with her teeth reduce and shatter it to her purpose. Biting down of the litter or bed, is the first sign of pregnancy. The number produced, generally between five and ten; and it is most advantageous always to destroy the weak or sickly ones, as soon as their defects can be perceived, because five healthy and well-grown rabbits are worth more than double the number of an opposite description, and the doe will be far less exhausted. She will admit the buck again with profit at the end of six weeks, when the young may be separated from her and weaned. Or the young may be suckled two months, the doe taken back at the end of five weeks, so that the former litter will leave her about a week before her next parturition. A notion was formerly prevalent, of the necessity for giving the buck immediately after the doe had brought forth, lest she should pine, and that no time might be lost; and if it were intended that no time might be lost in destroying the doe, such indeed, would be the most successful method. Great care should be taken that the doe, during her gestation, be not approached by the buck, or indeed by any other rabbit; as, from being harassed about, she will almost certainly cast her young. One doe in a thousand may devour her young; the sign

that she ought to be otherwise disposed of. Some does admit the buck with difficulty, although often apparently in season; such should be immediately fattened off, since it can never be worth while to keep any individual for breeding of a stock to be produced in such multitudes, against which there lies an objection. Should the doe be weak on her bringing forth, from cold, cough, or other causes, she will drink beer-candle, as well as any other lady; or warm fresh grains will comfort her; a salt-mash; scalded fine pollard, or barley-meal, in which may be mixed a small quantity of cordial horse-ball. With due attention to keeping them warm and comfortable, and guarding against every sudden impression from cold, and more particularly moist air, and with the aid of the best and most nourishing food, rabbits may be bred throughout the winter, with nearly equal success as in the summer season. But, in truth, their produce is so multitudinous, that one might well be satisfied with four or five litters, during the best part of the year, giving the doe a winter fallow.

6905. *Feeding.* According to Mowbray, it is better to feed three times than twice a day. The art of feeding rabbits with safety and advantage, is, always to give the upper hand to dry and substantial food. Their nature is congenial with that of sheep, and the same kind of food, with little variation, agrees with both. All weeds, and the refuse of vegetation, should be banished from rabbit feeding. Such articles are too watery and diuretic, and can never be worth attention, whilst the more solid and nutritious productions of the field may be obtained in such plenty, and will return so much greater profit. Rabbits may, indeed, be kept, and even fattened upon roots, good green moat, and hay; but they will pay for corn; and this may be taken as a general rule: rabbits which have as much corn as they will eat, can never take any harm from being indulged with almost an equal portion of good substantial vegetables. However, the test of health is, that their dung be not too moist. Many, or most, of the town feeders never allow any greens at all; the reason, I suppose, because they feed almost entirely on grains. The corn proper for rabbits, is oats, peas, wheat, pollard, and some give buck-wheat. The greens and roots, the same as our cattle crops, namely carrots, Jerusalem artichokes, and if potatoes, baked or steamed. Lucerne, cabbage leaves, clover, tares, furze. Mowbray has had them hoven, from eating rape; and not improbably, field-beet might have a similar effect. The best dried herbage is clover and meadow hay, and pea and bean straw.

6906. *Rabbits are generally sold from the teat*, but there is also a demand for those of larger size, which may be fattened upon corn and hay, with an allowance of the best vegetables. The better the food, the greater weight, better quality, and more profit, which is generally the case in the feeding of all animals. Some fatten with grains and pollard. Mowbray tried wheat, and potatoe oats, comparatively; but could find no difference in the goodness of their flesh. The rabbit's flesh being dry, the allowance of succulent greens may tend to render it more juicy; and probably the old complaint of the dryness of the flesh in Devon beef, entirely fed with hay, might be remedied in the same way. Rabbits are in perfection for feeding at the fourth or sixth month; beyond which period, their flesh becomes more dry and somewhat hard. It requires three months, or nearly so, to make a rabbit thoroughly fat and ripe; half the time will make them eatable, but by no means equal in the quality of the flesh: they may yet be over fattened, as appears by specimens exhibited a few years since at Lord Somerville's show, which were loaded with fat, without and within, like the best feeding sheep.

6907. *The flesh of the rabbit is esteemed equally digestible as that of fowls, and equally proper for the table of the invalid.*

6908. *Castrated rabbits* might be fattened, no doubt, to the weight of upwards of ten pounds, at six or seven months old. It is said to be successfully practised in Sussex, near Chichester, where on the average, not one in three hundred is lost by the operation, which is performed at five or six weeks old. With respect to the quantity of corn consumed in fattening; a young buck, which weighed three pounds, fit for the spit, was put up in good case in August, and was only one month in feeding, consuming not quite four quarts of oats, with hay, cabbage, lucerne, and chicory; the skin, silver and black, worth four pence.

6909. *In slaughtering full-grown rabbits*, after the usual stroke upon the neck, the throat should be perforated upwards towards the jaws with a small pointed knife, in order that the blood may be evacuated, which would otherwise settle in the head and neck. It is an abomination to kill poultry by the slow and torturing method of bleeding to death, hung up by the heels, the veins of the mouth being cut; but still more so the rabbit, which in that situation, utters horrible screams. The entrails of the rabbit, whilst fresh, are said to be good food for fish, being thrown into ponds.

6910. *The rabbit is a caressing animal*, and equally fond, with the cat, of the head being stroked; at the same time it is not destitute of courage. A whimsical lady admitted a buck rabbit into her house, when he became her companion for upwards of a twelvemonth. He soon intimidated the largest cats so much, by chasing them round the room, and darting upon them, and tearing off their hair by mouthfuls, that they very seldom dared to approach. He slept in the lap by choice, or upon a chair, or the hearth rug, and was as full of mischief and tricks as a monkey. He destroyed all the rush-bottomed chairs within his reach, and would refuse nothing to eat or drink, which was eaten or drank by any other member of the family.

6911. *Diseases.* No live stock is less liable to disease than the rabbit, with regular and careful attention, such as has been pointed out, so that any sudden and accidental disorder is best and most cheaply remedied by a stroke behind the ears. But want of care must be remedied, if at all, by an opposite conduct, and improper food exchanged for its contrary. Thus, if rabbits become pot bellied in the common phrase, from being fed on loose vegetable trash, they must be cured by good hard hay and corn, ground malt or pease, or any substantial or absorbent food. Their common liver complaints are incurable, and when such are put up to fatten, there is a certain criterion to be observed. They will not bear to be pushed beyond a moderate degree of fatness, and should be taken in time, as they are liable to drop off suddenly. The dropy and rot must be prevented, as they are generally incurable; nor is a rabbit worth the time and pains of a probable cure.

6912. *The hare, (Lepus timidus, L., fig. 696.)* if taken young may be tamed and domesticated, and has occasionally been nursed by a cat. Sonnini the naturalist, and Cowper the poet, had hares in a complete state of domestication. As the fur of this animal is of greater value for hat making than that of the rabbit, it would be a very desirable circumstance if it could be substituted for that animal in warrens. Its flesh would certainly be deemed preferable, and in general it is a large animal. It lives on the same sort of food as the rabbit, produces generally three young ones at a time, and breeds at least three times in a year. It is not improbable that in some dry situations where the soil is dry and poor, a hare warren or pack might be found to answer; the price in the metropolis being never less than ten times that of rabbits.

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6613. There is a *hare warren* near Banstead Downs: it contains about three acres of ground: 200 brace are usually kept in it; they are fed in the summer on clover, rape, &c.; and in the winter, on hay. The warren is surrounded by a brick wall about ten feet high, with openings at regular distances, within which are wire gratings on hinges: these give way to the hares, when they enter the warren; and they are so constructed, that they immediately close after them, and so prevents their escape.

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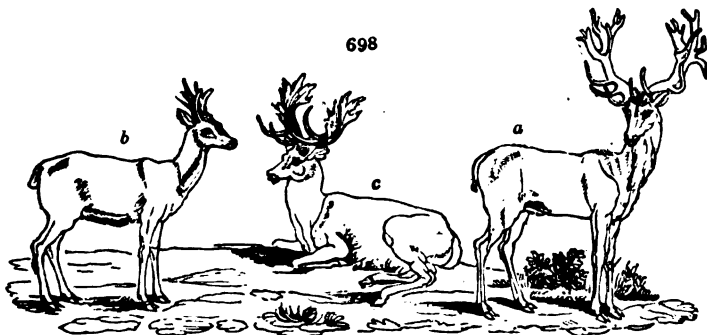
6614. The *Guinea pig*, or restless Cavy, (*Cavia Cobaya*, L. fig. 697.) is a native of Brazil, but domesticated in Europe, and treated and used like the tame rabbit. In Italy, the flesh is considered a delicacy, and the skins are nearly as valuable as those of rabbits. The Guinea pig is one of the most prolific of animals, and Buffon calculates that in twelve months only, 1000 might be produced from a single pair, as the female has been known to bring forth young when two months old only; the time of gestation is only three weeks; and she will produce at least every two months. The young are six or seven months before they arrive at their maturity of growth, but within the short period of twelve hours from their birth are nearly as alert and active as those fully grown, and therefore require parental assiduity only for a little time. Vegetables form their food, and on a great variety of these they will flourish and fatten. They drink but little, appear after eating to ruminate, and are extremely apt to be affected by cold. They are uncommonly clean in their habitations, and are often to be seen smoothing and cleansing their fur with particular attention and perseverance.

6615. The *fat dormouse* (*Myoxus glis*, L.) is a native of the woods of Germany and Russia; and has a good deal of the habits of the squirrel. It feeds on fruits, lays up a winter store, forms its nest in hollow trees, sleeps by day, and grows very fat in autumn. It was cultivated by the Romans, and highly prized by them as food. The body is six inches long.

6616. Of the *deer* (*Cervus*, L.) there are three species in cultivation in this country: the stag, roe, and fallow deer. The latter are now almost exclusively cultivated in parks, as articles of luxury, and, it is conceived, might answer to a small extent in farming.

6617. The *stag* (*C. Elephus*, L., fig. 698 a) is found in nearly all the temperate

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climates of Europe and Asia. It is also found in North America, but attains its largest size in Siberia. From the branchiness of its antlers, the elegance of its form and movements, and the strength of its limbs, it deservedly attracts particular admiration, and may be regarded as a principal embellishment of the forest. The stag is remarkable for a fine eye, and an acute sense of smelling. His ear also is exquisitely sensible, and musical sounds appear to possess over him the power of exciting complacency, if not rapture. His enemies not unfrequently employ the shepherd's pipe to decoy him to his destruction; and Playford, in his *Introduction to Music*, states that he once met a herd of twenty stags near Royston, which readily followed the tones of a violin and bagpipe, played by their conductors, but stopped whenever the music was suspended. Their whole progress from Yorkshire to Hampton Court was attended, and it was supposed extremely facilitated, by these sounds. The stag is simple and unsuspicious, and employs no arts to avoid detection or pursuit, until after having received considerable molestation. His food consists in winter of moss and bark; in spring of the catkins of willow and hazel, and the flowers and buds of cornel; in summer, of the grain of rye, and the tender shoots of the alder; in autumn, of the leaves of brambles, and the flowers of heath and broom. He eats with slowness, and ruminates with some considerable effort, in consequence of the distance between the first stomach and the mouth. In March,

generally, he sheds his antlers, which are not completely renewed till August. He will live to between thirty and forty years of age, and was formerly, amidst the other vulgar errors of antiquity, supposed capable of attaining most extraordinary duration. The stag is supposed to have been introduced from France into England, where he has latterly been made to give way to the fallow deer, an animal more gentle in its manners, and more valuable as food. In some parts of Scotland he is yet to be found in his original wild state. A stag of five years old is, in hunting, termed a hart; the female, hinds; and the young, fawns.

6618. *The roe* (*C. capreolus*, L., fig. 698 b) is the smallest of the deer tribes which are natives of Europe; it is generally of a reddish brown color; graceful, sprightly, and courageous, particularly cleanly, and delighting in dry and mountainous situations: it leaves a strong scent behind it, but possesses such arts of defence, that by various doublings and intermixtures of past with present emanations from its body, it frequently baffles the most experienced dogs, and remains in a state of security, while the full pack passes almost close by its retreat, distinguishing it neither by sight nor smell: it differs from the stag in the constancy of its attachment, and the parents and their young constitute a family, never associating with strangers: two fawns are generally produced by the female at a birth, one of each sex, which, living together, form a mutual and invincible attachment. When a new family is to be nursed, the former is driven off to provide for itself, but returns again after a certain interval to the mother, whose former affection is restored: a final separation speedily takes place, however, soon after this return, between the fawns of the season preceding the last and their dam; and the former remove to a distance, constituting a distinct establishment, and rearing an offspring of their own. When the female is about to bring forth, she secludes herself in some remote recess of the forest, from which she returns at the end of about ten days, with her fawns, just able slowly and weakly to follow her steps: in cases of danger she hides them in a place deemed by her most secure from the enemy, and attracts the attention of the latter from them to herself; happy, by her own perils or even destruction, to effect the security of her offspring. In winter, these animals feed on brambles, broom, heath, and catkins; and in spring they eat the young wood and leaves of almost every species of tree, and are said to be so affected, as it were with intoxication, by the fermentation of this food in their stomachs, that they will approach men and other enemies (whom they generally shun with great care), without apprehension or suspicion. The flesh of these animals is excellent, though after two years of age that of the males is ill-flavored and tough. The roe exists now in no part of Ireland, and, in Great Britain, only in a few districts of the Highlands.

6619. *The fallow deer* (*C. dama*, L., fig. 698 c) is in general much smaller than the stag; but in Spain is nearly equally large: in France and Germany it is rarely to be found, and it has never been known to have existed in America: it has the elegance of the stag, connected with a much more tractable disposition: it sheds its antlers, which, as in the stag species, are peculiar to the male, every year; is stated to live to the age of twenty years, and arrives at its maturity in three; it is by no means fastidious in its food.

6620. *Deer husbandry.* The author of the *Agricultural Survey of the County of Hertford*, observes, that "the Earl of Clarendon, justly considering that there is no more impropriety in converting one animal to profit than another, makes deer an object of husbandry. As soon as the rutting season is over, or usually about the 10th of November, his lordship selects from the herd, the weak ones, some of which would probably die in the winter, and keeps them in a small yard that has a shed on one side, and a net over the whole against pigeons, &c.; the spot very warm, and well sheltered. Their antlers are immediately sawn off, the place is well littered, and they are fed at a very small expense on pea-straw, hay, &c. warmth making up for the want of better food. At times, during the winter, they have clover-hay cut into chaff, and if they do not eat it well, a little salt is added. They have always plenty of water, and are kept perfectly clean: much attention should, he says, be paid by the keeper to make himself familiar with them, that he may enter the place without disturbing them. The first week in March he gives them oil-cake, about half a cake each a-day, with chaff, which fattens them so quickly, that all are gone in May. Before killing, they have some green meat given, to take away any ill flavor from the cake, supposing such to be the effect of the food, for it is certain that the venison is exceedingly good. As to weight, a haunch usually weighs about 24 pounds; a brace is sold for 15 guineas: the skin, worth 2l. 2s. is the keeper's perquisite; so that the value of a brace amounts to 17l. 17s. exclusive of some trifling articles. The purchaser sends for them." It is added, that his lordship usually fattens nine brace: his whole winter-stock rises to 350 head, in a park of 250 acres, but much of it is thickly covered with timber; 30 sheep and ten cows also fed in it. The park consumption of hay amounts to 32 loads, being reduced to that quantity by the use of much browse; all ash, elm, and Scotch pine, being brought for that purpose before faggotting, which not only saves hay, but improves the flavor of the venison.

6621. *By castrating the males of deer when newly dropped, which is not in the least dangerous, it affords the means of having good venison until Christmas, without any other sort of food than the common grass; they also fatten more quickly; the operation must, however, be performed while they are quite young.* (*Devonshire Report.*)

6622. *The moose deer, or elk* (*Cervus alces*, L.), is indigenous in Europe, America, and Asia, as far as Japan, and was formerly wild in this country though now extinct. It is of the size of a horse; gentle, except when teased by the gad-fly; feeds on twigs, and branches of trees, and marsh plants; goes on its hoofs with a shambling gait at the rate of

fifty miles a day; has a skin so hard as almost to resist a musket ball, but flesh tender and good. This animal might be introduced as an inhabitant of parks, where it would add to the variety of animated woody scenery and of venison.

6623. The rein deer (*Cervus tarandus*, L., fig. 699.) is an inhabitant of the alpine mountains of America, Europe, and Asia, and is too remarkable an animal, and too well known, to require a particular description or account of his habits. The tame variety have been introduced more than once in this country by the Hon. Daines Barrington, Bullock, and others, but cannot be kept in parks on account of the want of their particular lichen. As this lichen abounds on several mountains in Yorkshire, and on many in Scotland and Ireland, some patriotic and curious noblemen might attempt its cultivation. The milk and cream, as Dr. Clarke states, are most

excellent, and also the flesh, and even as an article of profit, the sale of the animals as breeding stock would pay for a time. Lichen hay might no doubt be imported at an easy rate from the gulf of Bothnia; and the animal by degrees in the course of a few generations might be habituated to grass or the spray of trees.

6624. The antelope (*Antelope*, L.) is a beautiful and numerous genus of animals, partaking of the nature of the goat and deer. Two species, the *A. saiga*, or scytheon, and the *A. rupicapra* or chamois, are natives of Europe, but the rest of hot climates. Antelopes, Pennant observes, are animals generally of a most elegant and active make; of a restless and timid disposition; extremely watchful, of great vivacity, remarkably swift and agile, and most of their boundings so light and elastic, as to strike the spectator with astonishment. What is very singular, they will stop in the midst of their course, gaze for a moment at their pursuers, and then resume their flight. As the chase of these animals is a favorite amusement with the eastern nations, from that may be collected proofs of their rapid speed. One of the highest compliments that can be paid to female beauty in the eastern regions, is *Aine el Cxazel*, 'you have the eyes of an antelope.' Some species of antelopes form herds of two or three thousand, while others keep in troops of five or six. They generally reside in hilly countries, though some inhabit plains: they often browse like the goat, and feed on the tender shoots of trees, which gives their flesh an excellent flavor.

6625. The common antelope (*A. cervicapra*, L.) abounds in Barbary, and in all the northern parts of Africa. It is somewhat less than the fallow deer: its horns are about sixteen inches long, surrounded with prominent rings almost to the top, where they are twelve inches distant from point to point. The horns are remarkable for a beautiful double flexion, which gives them the appearance of the lyre of the ancients. The color of the hair on the back is brown, mixed with red; the belly and inside of the thighs white; and the tail short.

6626. The chamois antelope (*A. rupicapra*, fig. 700 a) was formerly considered as belonging to the genus capra, and is generally called the chamois goat. It is found on the mountains of Switzerland, where it is very shy, and hunted both for its flesh and skin. (341.)

6627. The Scythian antelope, (*A. saiga*, L.) bears a good deal of resemblance to the common goat, and it is fully as easily tamed. They are found in immense flocks on the banks of Boristhenes and other parts of Russia, where they are valued both for the flesh and their skin, which is equal to that of the chamois for gloves.

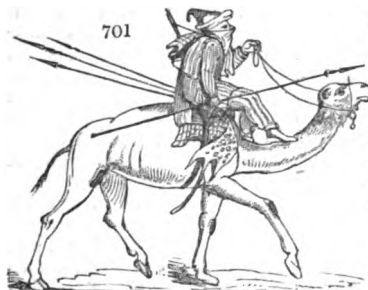
6628. The nilgau, or white-footed antelope, (*A. pictor*, L., fig. 700 b) is a large and beautiful species, known only within the space of a few years past. Its height is four feet one inch to the top of the shoulders; its length, from the bottom of the neck to the base of the tail, four feet; and the color a fine dark grey. The nilgau has of late years been often imported into Europe, and has bred in England. In confinement, it is generally pretty gentle, but is sometimes seized by fits of sudden caprice, when it will attack with



great violence the object of its displeasure. The nilgau is said to go with young about nine months, and to produce sometimes two at a birth: the young is of the color of a fawn.

6629. The above and various other species of antelopes might probably be acclimated and introduced in parks as objects of luxury. The cultivator who first succeeded in breeding them would find an ample demand at his own price if they happened to come in vogue.

6630. The camel (*Camelus*, L.), is a genus of which there are several species, three of which, the dromedary, or Arabian camel (fig. 701.), the Bachian, and the lama or Peruvian sheep, might certainly be partially acclimated in England, as the first is completely so in Italy. (297.) They live upon a very little of the coarsest herbage; might have a warm house well littered to retire to in winter, or in cold nights, and would form a singular ornament to park scenery. Besides their hair and skin are valuable, and they might be sold perhaps to romantic travellers, or cavalier quacks.



trance of the Spaniards, lamas were the Americans. Like camels, they travel slowly, but are persevering, tractable, and very sure-footed. Since the introduction of mules, they are much less cultivated; but before they were depended on to carry the ores dug out of the rich mines of Potosi. The lama is furnished as the camel with ability to abstain from water, by keeping a quantity in its second stomach. Like the camel, its feet also divide, and spread; but by no means equal to those of the camel. It is also furnished with a singular protuberance or spur behind, which enables it the better to lay hold on the ground. The tame

are of various colors, and some of them are smooth and others rough. The height of the lama is about four feet, and its length from the neck to the tail about six feet. It has a capacity of throwing out the saliva to a considerable distance, but which is not possessed of any acrid quality.

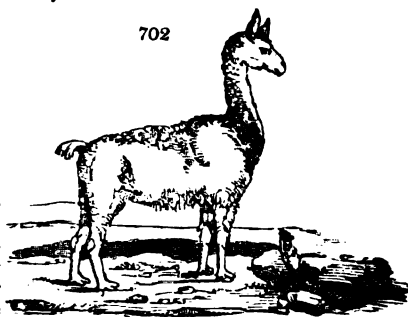
6632. The *camelopard* (*Camelopardalis giraffa*, L.), a most singular and noble animal, seventeen feet high, and as tame and gentle as the camel, might also be naturalized. It lives on the green spray of trees, and grass, and frequents forests.

6633. The *elephant*, *rhinoceros*, *musk ox*, and a variety of other exotic domestics, might be so far acclimated as to live in Britain as they do in the *Jardin des plantes* at Paris, viz., with an enclosure for each sort, and a lodge or house for protection in winter or during inclement weather. Were as much attention paid to introducing alive, and acclimating foreign animals, as there is directed to the same branch of culture in plants, we should soon possess a rich Fauna, and the public taste may in time take this direction.

6634. In *acclimating* the more tender animals, it might be desirable to rear a few generations, first in the south of Italy or in Spain, next in France and afterwards in the south of England. But the camel, musk ox, zebra, quagga, and antelope might be had at once from the acclimated stock in Italy.

6635. The *dog* (*Canis familiaris*), is an animal of universal utility and interest. From the earliest ages he has been the companion and assistant of the herdsman; and without his aid the flocks must have been confined to narrow limits, and consequently their propagation would have been greatly lessened. But hardy and bold, he watched by night, and toiled by day; securing his charge from the human thief, or the ravenous predatory beasts in the one, and collecting and organising their march during the other. Without the dog, sheep-farmers of the present day would be often at a loss to restrain the wanderings of their flocks; nor is he less useful in guarding the yard by nightly watchings.

6631. The *lama* (*Camelus glama*, L., fig. 702.) is the camel of South America; and appears to hold a middle place between the sheep, deer, and camel. Before the only beasts of burden known to the South



6636. The *genus canis* includes other animals, as the wolf, the fox, the jackal, and the hyena: and many naturalists have supposed our subject, the dog, to be only a mixed animal, originating from the union of some of these. Such is the opinion of Guldenstadt, Pallas, and Pennant; while the higher names of Blumenbach and Cuvier, are ranged among those who assign him a distinct and specific origin. Blaine, who has long successfully advocated the cause of the dog, has bestowed much research on this point; and appears clearly to have traced the dog through his numerous varieties, to a specific origin; but whether originating from a specific or a spurious source, the dog has descended down into such innumerable varieties, that a detail of the forms and properties of them, as they appear among us only, would be utterly impossible. The wants, as well as the luxuries of man, have, however, laid hold on these varieties, and have fixed them into permanencies, by confining the sexual intercourse to their congeners alone, and of this number there are no less than forty. It would be unnecessary to draw the character of the dog as stated at length by Linnaeus and others: the outlines are the same in all.

6637. The *shepherd's dog*, in an agricultural point of view, ranks foremost among the numerous varieties: indeed, the fanciful Buffon makes him the father of the whole race of dogs. But did no other difficulty arise, an insuperable one would be found in the opposite characters which different breeds of this dog possess. Few animals can be more unlike than the small sheep-dog of the Highlands of Scotland, and the monstrous drovers' dog of Smithfield.

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6638. The *English sheep-dog* (fig. 703.), is usually larger than the northern, is longer on the legs, and has been so long accustomed to have the tail taken off nearly close to the rump, that in some instances the custom has operated on nature; and these dogs are sometimes pupped tailless. The shepherd's dog is not, however, usually bred so large as the real cattle or drover's dog; but is yet sufficiently strong and fierce. Their color is in general black and white, with half pricked ears: they are extremely docile and intelligent, and seem almost to understand the looks of the shepherd. Some of them are smooth-coated; but by far the greater number are rough, and have their hair crisped, which enables them better to bear the effects of continued exposure. The dog very erroneously described by minor naturalists as the *cur dog*, is nothing more than the shepherd's dog, confined principally to the operations of the farm; and often bred rather taller, and either smooth or rough, according to circumstances. The very term *cur* destroys all individuality of breed; it being applied to characterise any dog of spurious origin: neither in these farm-yard dogs is any characteristic difference whatever observed in forms, qualities, or uses. When the sheep-dog is generally employed in watching the farm-yard, he becomes more fierce and active; he accommodates his powers to the particular circumstances required of him; he knows every field, and every beast, and keeps the whole in subjection. His bite is keen, and principally directed at the heels of cattle, by which he keeps himself safe, and does not injure them.

6639. The *sheep-dogs of Scotland* are varied in form and size (figs. 704. and 705.), but are all of them usually smaller than those in use in England: they are, nevertheless, without competitors in sagacity and excellence. Their general characters are, ears

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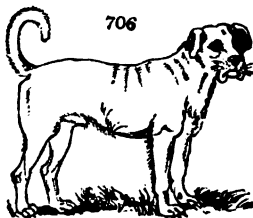
705



partially upright, head rather pointed, shaggy coat, and a remarkable villosity, or fulness of tail beneath. Immense flocks of sheep may be seen ranging the wilds, without other control save the shepherd and his dog, which receives his commands, executes them, and then waits for further instructions: or, he often acts with great judgment and promptitude from the impulses of his own sagacity, in which, perhaps, these dogs never shine more than in their readiness to distinguish the individuals of their own flocks, and their adroitness in keeping out intruders. In driving a number of sheep to any distance, a well-trained dog never fails to confine the sheep to the road: he watches every avenue that leads from it, where he takes his stand, threatening every delinquent; and pursues the stragglers, forcing them into the ranks without doing them any injury. If the herdsman be at any time absent, he rests satisfied, knowing his dog will not abandon his charge, but will keep them together; and the moment he returns, the sagacious animal gives up his trust, or conducts them to his master according to the word or signal given.

6640. The *mastiff or guard* (fig. 706.), is a noble animal derived from the Dane; but by selection and cultivation is rendered thicker and heavier, though less tall than his original. The powers of this dog are immense; and as a guard he is unrivalled: having the ferocity of a tiger to a stranger, with the gentleness of a lamb towards those he knows. His sagacity in detecting the attempts of robbers, and his fidelity in resisting all their bribes, are such, that it is to be lamented his breed has given place to that of the Newfoundland dog, whose qualities as a guard are certainly not equal to his. The mastiff is characterised by small pendulous ears, smooth coat, color various, often reddish or brindled. The lips are pendulous, jaws of immense strength, but seldom under-hung; and his general form is symmetrical for strength.

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6641. The *bull-dog* can no otherwise be considered as connected with agriculture, than as he is too often used in the disgraceful and inhuman sport of bull-baiting: and however we may admire his invincible fortitude, and his contempt of pain and danger, we must allow him to be the most useless among the dog species. In his attack on cattle he always aims at the front, and generally fastens on the upper lip, where he will hang in spite of every effort of the animal to disengage himself.

6642. The *terrier* (fig. 707.) is a dog of very great utility, and of very varied form and size. His qualities have gained him the greatest care in selection, training, and continuing the numerous distinct breeds we witness. The principal varieties may be reduced into the rough and the smooth breeds. The *rough breed* is originally derived from Scotland, where it is still preserved in a few families in its original purity. These specimens are seldom large, but are exceedingly rough and shaggy in their hair, which is much crisped and brindled. The rough breed in England has become larger, and is very often seen white. When mixed with the bull breed, this terrier becomes fierce, much inclined to combat, and forms an excellent guard. The *smooth breed* produces endless varieties; the principal of which is an elegant black animal with tan markings. A second variety is of varied colors, smaller, thicker, and longer; and is used for earthing foxes, badger-baiting, and vermin killing in general. For rabbit hunting, a wry-legged breed is in considerable request. Although particular varieties are often appropriated to particular purposes, yet all have a common property, which renders them invaluable to the agriculturist; which is their determined hostility to those animals termed vermin, as foxes, otters, badgers, polecats; with rats and mice. To attack the former, they are bred strong, and have a portion of the bull breed in them: for the latter their hardihood, activity, and keenness of gripe, are particularly studied: in which the middle-sized breeds are frequently found to excel.

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6643. The *pointer*, *setter*, and *spaniel*, (fig. 708.), it might seem at the first view unnecessary to introduce to the notice of the agriculturist; but a little examination of the subject will show that they



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may be made an object of considerable importance to the farmer. Few dogs command such prices as sporting dogs; and few persons have such opportunities of rearing them so cheaply, or so well, as farmers. Many farmers shoot game; most of them do it more or less: and it would be very easy to make two brace of pointers or setters, with one or two brace of spaniels, pay a considerable part of the rent of the farm, without other expense than skimmed milk and potatoes, or occasionally a little barley meal. We will suppose that a farm has on it three pointer bitches, and one pointer dog, all of acknowledged excellence, and two out of the three bitches may be expected to go to heat early, and to produce progeny between the seasons of shooting, when they are wanted: from these, four brace of puppies may be saved, and by continually following the servants and their master, they will become so handy, that their breaking will be effected daily, and without any other trouble than what occurs in restraining them when a little wild. If their breed is very good, their stopping and barking will commence towards the end of the first season, and during the periods between this and the next autumn they may be steadied and practised in fetching their game, &c., as directed in good sporting works. At the commencement of the following season, if they have been well attended to, although only fifteen months old, the whole may be sold to the London or country dealers, to average six or seven guineas each: or if sold privately, they will fetch from eight to twelve and fifteen guineas each: out of which, perhaps not more than half a guinea can fairly be deducted for keep, &c. The trouble occasioned to the master will be trifling, because connected with a pleasing employ to him as a sportsman, and who will thus have his own sports for nothing.

6644. *Setters*, as more valuable, will fetch a higher price: but they do not always command so ready a sale, and are more troublesome to break.

6645. *Spaniels* are commonly thought, but most erroneously, almost to break themselves. A really well broke spaniel, however, is so rare, that instead of being worth two or three guineas, which is the usual price, it will fetch from five to ten pounds. It would be even less difficult to the farmer to rear spaniels than pointers; and by following him continually about the grounds they might be taught to perfect obedience, and close rangings, which are the grand requisites, without trouble or expense. In this way, four or five brace might be easily brought every season to market, and would always command a ready sale, and a price according to the perfection of their breaking.

6646. In the *breeding and rearing* of dogs for the above purposes, it is necessary to observe the greatest care in their original selection; that the breed be of the very best, and one which as it were breaks itself, for this shows the purity of the breed. It is likewise no less necessary that the breed be carefully preserved so: to do which, the moment the dogs begin to smell a bitch, shut her and the intended male closely up, in a confinement inaccessible to other dogs, and there let them remain a fortnight. It is likewise, almost equally necessary, that the dogs peculiarly appropriated to agriculturists, particularly the shepherd's dog, should be bred as pure, for no animal is more liable to sport into varieties. No crossing can on any account be permitted; but choice may be made among families of the same variety. In the rearing of this dog, his education should be early and carefully attended to, to make him hardy and familiar with all the signs of the shepherd; who ought himself to be equal to the regular education of his own dog.

6647. The *diseases of dogs* are very numerous. The following are described by Blaine, as the most prevalent, with their methods of cure.

6648. The *canine asthma* is hardly ever observed to attack any but either old dogs, or those who, by confinement, too full living, and want of exercise, may be supposed to have become diseased by these deviations from a state of nature. It is hardly possible to keep a dog very fat for any great length of time, without bringing it on. This cough is frequently confounded with the cough that precedes and accompanies distemper, but it may be readily distinguished from this by an attention to circumstances, as the age of the animal, its not affecting the general health, nor producing immediate emaciation, and its less readily giving way to medicine.

6649. The *cure* is often very difficult, because the disease has in general been long neglected before it is sufficiently noticed by the owners. As it is in general brought on by confinement, too much warmth, and over-feeding; so it is evident the cure must be begun by a steady persevering alteration in these particulars. The medicines most useful, are alteratives, and of these occasional emetics are the best. One grain of tartarised antimony (*i. e.* tartar emetic) with two, three, or four grains of calomel, is a very useful and valuable emetic. This dose is sufficient for a small dog, and may be repeated twice a week with great success, — always with palliation.

6650. Of *diseases of the eyes*, dogs are subject to almost as great a variety as ourselves, many of which end in blindness. No treatment yet discovered will remove or prevent this complaint.

6651. *Sore eyes*, though not in general ending in blindness, is very common among dogs. It is an affection of the eyelids, is not unlike the scrofulous affection of the human eyelids, and is equally benefited by the same treatment: an unguent made of equal parts of nitrated quicksilver ointment, prepared tatty and lard, very lightly applied. Dropsy of the eyeball is likewise sometimes met with, but is incurable.

6652. *Cancer*. The virulent dreadful ulcer, that is so fatal in the human subject, and is called cancer, is unknown in dogs; yet there is very commonly a large scirrhous swelling of the teats in bitches, and of the testicles (though less frequent) in dogs, that as it sometimes becomes ulcerated, so it may be characterised by this name. In the early state of the disease discutients prove useful, as vinegar with salt, and camphor and Spanish flies, with mercurial ointment, have sometimes succeeded; taking care to avoid irritating the part so much as to produce blister. But when the swelling is detached from the belly, and hangs pendulous in the skin, it had better be removed, and as a future preventive suffer the bitch to breed. Scirrhous testicles are likewise sometimes met with; for these no treatment yet discovered succeeds but the removal of the part, and that before the spermatic chord becomes much affected, or it will be useless.

6653. *Colic*. Dogs are subject to two kinds of colic; one arising from constipation of the bowels, the other is of a kind peculiar to dogs, apparently partaking of the nature of rheumatism, and also of spasm. From a sudden or violent exposure to cold, dogs become sometimes suddenly paralytic, particularly in the hinder parts; having great tenderness and pain, and every appearance of lumbago. In every instance of

this kind, there is considerable affection of the bowels, generally costiveness, always great pain. A warm bath, external stimulants, but more particularly active aperients, remove the colic. Colic arising from costiveness, is not in general violently acute from the pain it produces; sometimes, however, it appears accompanied with more spasms than is immediately dependant on the confinement of the bowels. In the former give active aperients, as calomel with pil. cochis, *i. e.* aloetic pill and glysters; in the latter castor oil with laudanum and ether.

6654. *Cough.* Two kinds of cough are common among dogs, one accompanying distemper, the other in an asthmatic affection of the chest. (See 6648. 6656.)

6655. *Distemper.* This is by far the most common and most fatal among the diseases of dogs; hardly any young dog escaping it; and of the few who do escape it in their youth, three-fourths are attacked with it at some period afterwards: it being a mistake that young dogs only have it. It, however, generally attacks before the animal arrives at eighteen months old. When it comes on very early, the chances of recovery are very small. It is peculiarly fatal to greyhounds, much more so than to any other kind of dog, generally carrying them off by excessive scouring. It is very contagious, but it is by no means necessary that there should be contagion present to produce it; on the contrary, the constitutional liability to it is such, that any cold taken may bring it on; and hence it is very common to date its commencement from dogs being thrown into water, or shut out on a rainy day, &c. There is no disease which presents such varieties as this, either in its mode of attack, or during its continuance. In some cases it commences with purging, in others by fits. Some have cough only, some waste, and others have moisture from the eyes and nose, without any other active symptom. Moist eyes, dulness, wasting, with slight cough, and sickness, are the common symptoms that betoken its approach. Then purging comes on, and the moisture from the eyes and nose from mere mucus becomes pus, or matter. There is also frequently sneezing, with a weakness in the loins. When the disease in this latter case is not speedily removed, universal palsy comes on. During the progress of the complaint, some dogs have fits. When one fit succeeds another quickly, the recovery is extremely doubtful. Many dogs are carried off rapidly by the fits, or by purging; others waste gradually from the running from the nose and eyes, and these cases are always accompanied with great marks of putridity.

6656. *The cure.* In the early stages of the complaint give emetics; they are peculiarly useful. A large spoonful of common salt, dissolved in three spoonfuls of warm water, has been recommended; the quantity of salt being increased according to the size of the dog, and the difficulty of making him to vomit. While a dog remains strong, one every other day is not too much: the bowels should be kept open, but active purging should be avoided. In case the complaint should be accompanied with excessive looseness, it should be immediately stopped by balls made of equal parts of gum arabic, prepared chalk, and conserve of roses with rice milk as food. Two or three grains of James's powder may be advantageously given at night, in cases where the bowels are not affected, and in the cases where the matter from the nose and eyes betokens much putridity, we have witnessed great benefits from balls made of what is termed Friars balsam, gum gualiacum, and chamomile flowers in powder: but the most popular remedy is a powder prepared and vended under the name of Distemper Powder, with instructions for the use of it. Dogs, in every stage of the disease, should be particularly well fed. A seton we have not found so useful as is generally supposed; where the nose is much stopped, rubbing tar on the upper part is useful, and when there is much stupidity, and the head seems much affected, a blister on the top is often serviceable.

6657. *Fits.* Dogs are peculiarly subject to fits. These are of various kinds, and arise from various causes. In distemper, dogs are frequently attacked with convulsive fits, which begin with a champing of the mouth and shaking of the head, gradually extending over the whole body. Sometimes an active emetic will stop their progress, but more generally they prove fatal. *Worms* are often the cause of fits in dogs. These deprive the animal wholly of sense; he runs wild till he becomes exhausted, when he gradually recovers, and perhaps does not have one again for some weeks. Confinement produces fits and likewise costiveness. Cold water thrown over a dog will generally remove the present attack of a fit; and for the prevention of their future recurrence it is evident, that the foregoing account of causes must be attended to.

6658. *Inflamed bowels.* Dogs are very subject to inflammation of their bowels, from costiveness, from cold, or from poison. When inflammation arises from costiveness it is in general very slow in its progress, and is not attended with very acute pain, but it is characterised by the want of evacuation and the vomiting of the food taken, though it may be eaten with apparent appetite. In these cases the principal means to be made use of, are the removal of the constipation by active purging, clysters, and the warm bath. Calomel with aloes forms the best purge. But when the inflammation may be supposed to arise from cold, then the removing of any costiveness that may be present is but a secondary consideration. This active kind of inflammation is characterised by violent panting, total rejection of food, and constant sickness. There is great heat in the belly, and great pain; it is also accompanied with great weakness, and the eyes are very red. The bowels should be gently opened with clysters, but no aloes or calomel should be made use of. The belly should be blistered, having first used the warm bath. When the inflammation arises from poison, there is then constant sickness, the nose, paws, and ears are cold, and there is a frequent evacuation of brown or bloody stools. Castor oil should be given, and clysters of mutton broth thrown up, but it is seldom any treatment succeeds.

6659. *Inflamed lungs.* Pleurisy is not an uncommon disease among dogs. It is sometimes epidemic, carrying off great numbers. Its attack is rapid, and it generally terminates in death on the third day, by a great effusion of water in the chest. It is seldom that it is taken in time, when it is, bleeding is useful, and blisters may be applied to the chest.

6660. *Madness.* The symptoms of madness are concisely summed up by Daniel, in the following words: "at first the dog looks dull, shews an aversion to his food and company, does not bark as usual, but seems to murmur; is peevish and apt to bite strangers; his ears and tail drop more than usual, and he appears drowsy; afterwards he begins to loll out his tongue and froth at the mouth, his eyes seeming heavy and watery: if not confined he soon goes off, runs panting along with a dejected air, and endeavors to bite any one he meets. If the mad dog escapes being killed, he seldom runs above two or three days, when he dies exhausted with heat, hunger, and disease. As this is a subject of no slight importance, we shall stand excused for introducing the criteria as described by Blaine, whose account of the disease, founded on long experience and attentive observation, is calculated to remove many unfounded and dangerous prejudices relative to it. He describes it as commencing sometimes by dullness, stupidity, and retreat from observation; but more frequently, particularly in those dogs which are immediately domesticated around us, by some alteration in their natural habits; as a disposition to pick up and swallow every minute object on the ground; or to lick the parts of another dog incessantly; or to lap his own urine, &c. About the second or third day the disease usually resolves itself into one of two types. The one is called raging, and the other dumb madness. These distinctions are not however always clear; and to which is owing so much discrepancy in the accounts given by different persons of the disease.

6661. The *raging madness*, by its term, has led to an erroneous conclusion, that it is accompanied with violence and fury; which, however, is seldom the case: such dogs are irritable and snappish, and will commonly fly at a stick held to them; and are impatient of restraint: but they are seldom violent except when irritated or worried. On the contrary, till the last moment they will often acknowledge the voice of their master and yield some obedience to it. Neither will they usually turn out of their way to bite human persons; but they have an instinctive disposition to do it to dogs; and in a minor degree to other animals also: but as before observed, seldom attack mankind without provocation.

6662. *Dumb madness* is so called, because there is seldom any barking heard, but more particularly, because the jaw drops paralytic, and the tongue lolls out of the mouth, black, and apparently strangulated: a strong general character of the disease, is the disposition to scratch their bed towards their belly; and equally so is the general tendency to eat trash, as hay, straw, wood, coals, dirt, &c.: and it should be remembered, that this is so very common and so invariable; that the finding these matters in the stomach after death, should always render a suspicion formed of the existence of the disease, confirmed into certainty. Blane is also at great pains to disprove the notion generally entertained, that rabid dogs are averse to water; and neither drink or come near it. This error he contends has led to most dangerous results; and is so far from true, that mad dogs from their heat and fever are solicitous for water, and lap it eagerly. When the dumb kind exists in its full force, dogs cannot swallow what they attempt to lap; but still they will plunge their heads in it, and appear to feel relief by it: but in no instance out of many hundreds, did he ever discover the smallest aversion to it. He lays very great stress on the noise made by rabid dogs, which he says is neither a bark nor a howl, but a tone compounded of both. It has been said by some that this disorder is occasioned by heat or bad food, and by others that it never arises from any other cause but the bite. Accordingly this malady is rare in the northern parts of Turkey, more rare in the southern provinces of that empire, and totally unknown under the burning sky of Egypt. At Aleppo, where these animals perish in great numbers, for want of water and food, and by the heat of the climate, this disorder was never known. In other parts of Africa, and in the hottest zone of America, dogs are never attacked with madness. Blaine knows of no instance of the complaint being cured, although he has tried to their fullest extent, the popular remedies of profuse bleedings, strong mercurial and arsenical doses, vinegar, partial drowning, night shade, water plantain, &c.: he therefore recommends the attention to be principally directed towards the prevention of the malady.

6663. The *preventive treatment of rabies or madness* is, according to Blaine, always an easy process in the human subject, from the immediate part bitten being easily detected; in which case the removal of the part by excision or cautery is an effectual remedy. But, unfortunately for the agriculturist, it is not easy to detect the bitten parts in cattle, nor in dogs; and it would be therefore most desirable if a certain internal preventive were generally known. Dr. Mead's powder, the Ormskirk powder, sea bathing, and many other nostrums are deservedly in disrepute: while a few country medicines, but little known beyond their immediate precincts, have maintained some character. Conceiving that these must all possess some ingredient in common, he was at pains to discover it; and which he appears to have realized by obtaining among others the composition of Webb's Watford drink. In this mixture, which is detailed below, he considers the active ingredient to be the *buxus* or box, which has been known as a prophylactic as long as the times of Hippocrates and Celsus, who both mention it. The recipe detailed below has been administered to nearly three hundred animals of different kinds, as horses, cows, sheep, swine, and dogs: and appears to have succeeded in nineteen out of every twenty cases where it was fairly taken and kept on the stomach. It appears also equally efficacious in the human subject; in which case he advises the extirpation of the bitten parts also. The box preventive is thus directed to be prepared:

Take of the fresh leaves of the tree-box	2 ounces.
of the fresh leaves of rue	2 ounces.
of sage,	1 ounce.

chop these fine, and boil in a pint of water to half a pint; strain carefully, and press out the liquor very firmly; put back the ingredients into a pint of milk, and boil again to half a pint; strain as before; mix both liquors, which forms three doses for a human subject. Double this quantity is proper for a horse or cow. Two thirds of the quantity is sufficient for a large dog; half for a middling sized, and one third for a small dog. Three doses are sufficient, given each subsequent morning fasting; the quantity directed being that which forms these three doses. As it sometimes produces strong effects on dogs, it may be proper to begin with a small dose, but in the case of dogs we hold it always prudent to increase the dose till effects are evident, by the sickness, panting, and uneasiness of the dog. In the human subject, where this remedy appears equally efficacious, we have never witnessed any unpleasant or active effects, neither are such observed in cattle of any kind. About forty human persons have taken this remedy, and

in every instance it has succeeded equally as with animals: but candor obliges us to notice, that in a considerable proportion of these, other means were used, as the actual or potential cautery: but in all the animals other means were purposely omitted. That this remedy, therefore, has a preventive quality, is unquestionable, and now perfectly established; for there was not the smallest doubt of the animals mentioned either having been bitten, or of the dog being mad who bit them, as great pains were in every instance taken to ascertain these points.

6664. *To prevent canine madness*, Pliny recommends, worming of dogs; and from his time to the present it has had, most deservedly says Daniel, its advocates. He tells us, that he has had various opportunities of proving the usefulness of this practice, and recommends its general introduction. Blaine, on the contrary, asserts, that the practice of worming is wholly useless, and founded in error; and that the existence of any thing like a worm under the tongue is incontestibly proved to be false; and that what has been taken for it, is merely a deep ligature of the skin, placed there to restrain the tongue in its motions. He also observes, that the pendulous state of the tongue in what is termed dumb madness, with the existence of a partial paralysis of the under jaw, by which they could not bite, having happened to dogs previously wormed, has made the inability to be attributed to this source, but which is wholly an accidental circumstance; and happens equally to the wormed and unwormed dog.

6665. *Mange*. This is a very frequent disease in dogs, and is an affection of the skin, either caught by contagion, or generated by the animal. The scabby mange breaks out in blotches along the back and neck, and is common to Newfoundland dogs, terriers, pointers, and spaniels, and is the most contagious. The cure should be begun by removing the first exciting cause, if removable, such as filth or poverty; or, as more general the contrary (for both will equally produce it), too full living. Then an application should be made to the parts, consisting of sulphur and sal ammoniac: tar-lime-water will also assist. When there is much heat and itching, bleed and purge. Mercurials sometimes assist, but they should be used with caution; dogs do not bear them well.

6666. *Worms*. Dogs suffer very much from worms, which, as in most animals, so in them, are of several kinds; but the effects produced are nearly similar. In dogs having the worms the coat generally stares; the appetite is ravenous, though the animal frequently does not thrive; the breath smells, and the stools are singular, sometimes loose and slimy, at others hard and dry; but the most evil they produce is occasional fits, or sometimes a continued state of convulsion, in which the animal lingers some time, and then dies; the fits they produce are sometimes of the violent kind, at others they exhibit a more stupid character, the dog being senseless, and going round continually. The cure consists, while in this state, in active purgatives joined with opium, and the warm bath; any rough substance given internally, acts as a vermifuge to prevent the recurrence.

6667. *The worming of whelps* is performed with a lancet, to slit the thin skin which immediately covers the worm; a small awl is then to be introduced under the centre of the worm to raise it up; the farther end of the worm will, with very little force, make its appearance, and with a cloth taking hold of that end, the other will be drawn out easily; care should be taken that the whole of the worm comes away without breaking, and it rarely breaks unless cut into by the lancet, or wounded by the awl.

6668. *The cat (Felis catus, L.)* is distinguished from the lion, tiger, leopard, and others of the genus *Felis*, by its annulate tail. Its habits are thus given by Linnæus. Inhabits woods of Europe and Asia; domesticated every where; when tranquil, purrs, moving the tail; when irritated is very active, climbs, spits, emits a foetid odor; eyes shine at night, the pupil by the day a perpendicular line; by night large, round; walks with its claws drawn in; drinks sparingly; urine of the male corrosive; breath foetid; buries its excrements; makes a horrid mewling in its amours; mews after and plays with its kittens; wags its tail when looking after prey; the lion of mice, birds, and the smaller quadrupeds; peaceful among its tribe; eats flesh and fish, refuses hot or salted things, and vegetables; washes behind its ears before a storm; back electric in the dark; when thrown up, falls on its feet; is not infested with fleas; gravid 63 days, brings three to nine young, blind nine days; delight in marum, cat-mint, and valerian.

6669. *The cat is of great use in the farmery* in catching mice, rats, and even birds. It is most desirable to keep males, as where females are kept, the noisy gallantry of the adjoining tom cats is exceedingly annoying.

6670. *The Genet cat (Viverra genetia)*, is a species of weasel, with an annulate tail, and spotted blackish tawny body. It is a native of Asia, Spain, and France; is mild and easily tamed, and answers all the purposes of a cat at Constantinople and other places.

6671. *The ferret (Mustella ferro, L., fig. 709.)*, is an animal of the weasel and polecat kind, distinguished by its red fiery eyes. It is a native of Africa, but is tamed in Europe for the purpose of catching rabbits. It procreates twice a year, is gravid six weeks, brings from six to eight young: smells very foetid. The ferret is very susceptible of cold, and must be kept in a box provided with wool, or other warm materials, and may be fed with bread and milk. Its sleep is long and profound, and it awakes with a voracious appetite, which is most highly gratified by the blood of small and young animals. Its enmity to rats and rabbits is unspeakable, and when either are, though for the first time, presented to it, it seizes and bites them with the most phrensied madness. When employed to expel the rabbit from its burrows, it must be muzzled, as otherwise it will suck the blood of its victim, and instantly fall into a profound sleep, from which it will awake only to

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the work of destruction, committing in the warren, where it was introduced only for its services, the most dreadful waste and havoc. It is possessed of high irritability, and when particularly excited, is attended with an odor extremely offensive.

CHAP. IX.

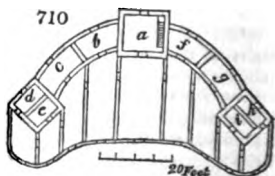
Of Animals of the Bird kind employed in Agriculture.

6672. Though *poultry* form a very insignificant part of the live-stock of a farm, yet they ought not to be altogether despised. In the largest farm, a few domestic fowls pick up what might escape the pigs and be lost; and on small farms, and among cottagers, the breeding and rearing of early chickens and ducks, and in some situations the rearing of turkeys, and the keeping of geese, are found profitable. There are few who do not relish a new egg or a pancake, not to say the flesh of fowls; and there are some of these comforts which happily can be had in as great perfection in the cottage as in the palace. The various kinds of domestic fowls and birds which are used in agriculture, may be classed as gallinaceous, or with cleft feet; anserine, or web-footed; and birds of fancy or luxury. Before proceeding to the first division, we shall offer some remarks on poultry-hovels.

SECT. I. *Of Poultry Houses and their Furniture and Utensils.*

6673. The situation of the poultry house should be dry, and exposed either to the east or south-east, so as to enjoy the sun's rays in winter as soon as he appears above the horizon. Though in many cases all the commoner sorts of poultry are lodged in the same apartment, yet to be able to bestow on each species its proper treatment, they ought to be separated by divisions, and enter by separate doors. Apartments for aquatic fowls may be made in part under those of the gallinaceous tribe, and the peacock often prefers roosting on a tree, or on the roof of high buildings, when it forms an excellent watch bird to the poultry yard or farmery.

6674. Where a complete set of poultry houses are intended, then a situation should be fixed on near or close to the farmery, and with ample space around for the fowls to disperse over in the day time, and one or more ponds for the aquatic sorts. A space thirty feet by fifty feet may be made choice of for the buildings and yard (fig. 710.); the building may be ranged along the north side, and the three other sides enclosed with a trellis or wire fence, from six to eight feet in height, and subdivided with similar fences, according to the number of apartments. The hen-house (a), and turkey-house (b), may have their roosts (c c), in part over the low houses for ducks (d) and geese (e), and besides these there may be other apartments (f, g, h) for hatching, or newly hatched broods, for fattening, to serve as an hospital, or for retaining, boiling, or otherwise preparing food, killing poultry, and other purposes. A flue may pass through the whole in moist or very severe weather; the walls should be built hollow in the manner already described, (6304.) which will at the same time be a saving of material; and the windows ought to have outside shutters both for excluding excessive heats and excessive colds. In every apartment there ought to be a window opposite the door in order to create a thorough draught when both are opened, and also a valve in the roof to admit the escape of the hottest and lightest air. Every door ought to have a small opening at bottom for the admission of the fowls when the door is shut. The elevation (fig. 711.) should be in a simple style, and there may be a pigeonry over the central building.



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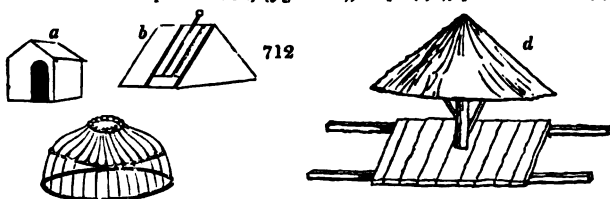
6675. In ordinary cases, where poultry are kept on a farm merely to consume what would otherwise be lost, one or two compartments of the low range of buildings on the south side of the yard are usually devoted to them; or any dry convenient place according to the general plan of the farmery.

6576. *The furniture or fixtures of the poultry houses are very few; the roost is sometimes a mere floor or loft, to which the birds fly up or ascend by a ladder; at other times it is nothing more than the coupling timbers of the roof, or a series of cross battens; but the most approved mode is a series of rough polygonal or angular battens or rods rising in gradation from the floor to the roof, as already explained, (2682. and 2684.).* The battens placed at such a distance horizontally, as that the birds when roosting may not incommode each other by their droppings. For this purpose they should be a foot apart for hens, and eighteen inches apart for turkeys. The slope of the roost may be about 45°, and the lower part should lift up by hinges in order to admit a person beneath to remove the dung. No flying is requisite in the case of such a roost as the birds ascend and descend by steps.

6577. *Nests are sometimes fixtures, in which case they are niches built against the wall, not unlike wine bins; where there is more than one tier on the ground floor, each superincumbent range must have a projecting balcony in front of about a foot in width, with stairs of ascent at convenient distances.*

6578. *A small boiler for preparing food may sometimes be requisite, though on a small scale this may be done in the kitchen.* Watering troughs are generally fixed in the yards. In confined situations there should be a large cistern of sand, in which the fowls may nestle and roll about in order to free themselves from vermin; there should also be a spot composed of gravel, sand, and soft earth, for nearly the same purpose, but more especially for exercising the young chickens. A roof for shelter and protection from the sun may very appropriately be placed over this last compartment, or a part of it.

6579. *The utensils are the portable nest, (fig. 712 a), coops (b, c), portable shelter (d); feeding*



dishes, corn bin for retaining a store of food, egg basket, and feather bags. We avoid enumerating the utensils used in cramming, considering that unwholesome and disgusting practice as unfit for the present age.

SECT. II. Of Gallinaceous Fowls, their Kinds, Breeding, Rearing, and Management.

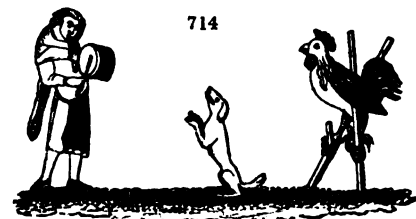
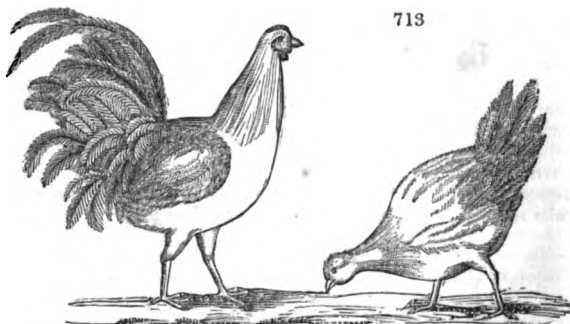
6680. Under the order *Gallinæ*, are included the common hen, turkey, Guinea, and peacock; and we shall here treat of each of these genera in succession.

6681. *The dunghill cock and hen, (Phasianus gallus,)* is a native of the warm countries of the east, and still found in a wild state on the banks of the Phasis (now Rioni) in Georgia; but is now domesticated almost every where. It is both granivorous and carnivorous. The term chicken is applied to the female young of gallinaceous animals, till they are four months old; afterwards they are called pullets, till they begin to lay, when they become hens. The male is a chicken till he is three months old, then he is a cock bird till the age of twelve months, when he becomes a cock; unless indeed he has been artificially deprived of the faculty of procreation, when he becomes a capon, and when the ovarium is taken from a pullet or hen, she is called a hen capon.

6682. *The varieties of a bird so long under culture may naturally be expected to be numerous; those most esteemed in Britain at the present time, are the following.*

6683. *The common dunghill cock and hen, middle size, of every color, and hardy.*

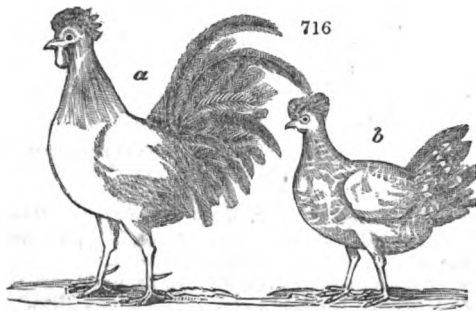
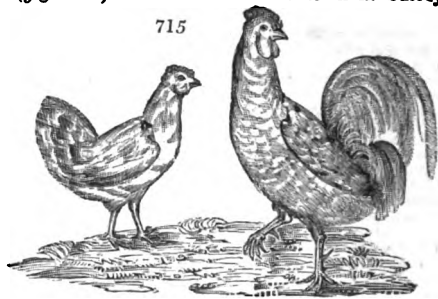
6684. *The game-cock and hen, (fig. 713.)* rather small in size, delicate in limb, color generally red or brown; flesh white, and superior to that of any other variety for richness and delicacy of flavor;



eggs small, fine shaped, and extremely delicate; the chickens are difficult to rear from their pugnacity of disposition. The game cock has long been a bird both of cruel and curious sport in this as well as other countries, (fig. 714.); but the taste for this amusement, like that for others suited to times of comparative leisure and ignorance, is now happily on the decline in Britain.

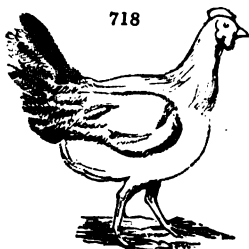
6685. *The Dorking cock and hen*, (fig. 715.) so named from the town in Surrey of that name, is the largest variety; shape handsome, body long and capacious, legs short, five claws on each foot; eggs large, and lays abundantly; color of the flesh inclining to yellowish or ivory. Both hens and cocks often made into capons.

6686. *The Poland cock and hen* (fig. 716 a) were originally imported from Holland. The color shining black, with white tops on the head of both cock and hen; head flat, surmounted by a fleshy protuberance, out of which spring the crown feathers, or top, white or black, with the



6687. *The every-day cock and hen*, is a subvariety of the above, of Dutch origin; they are of smaller size, and said to be everlasting layers. Their tops are large, and should be periodically clipped near the eyes, otherwise, according to Mowbray (*Treatise on Domestic Fowls*, 24 and 115.), they will grow into the eyes of the fowls and render them very subject to alarm.

6688. *The bantam cock and hen* (fig. 717.), is a small Indian breed, valued chiefly for its grotesque figure and delicate flesh. Mowbray mentions a subvariety, extremely small, and as smooth legged as a game fowl. From their size and delicacy they are very convenient, as they may always be used as substitutes for chickens, when small ones are not otherwise to be had. They are also particularly useful for sitting upon the eggs of partridges and pheasants, being good nurses, as well as good layers. There are two varieties of this breed, of which the more common is remarkable for having the legs and feet furnished with feathers. The other, and more scarce variety, is even smaller; and is most elegantly formed, as well as most delicately limbed. There is a society of fanciers of this breed, who rear them for prizes, among which Sir John Sebright stands pre-eminent.



6689. *The Chittagong or Malay hen* (fig. 718.) is an Indian breed, and the largest variety of the species. They are in color, striated yellow and dark brown, long necked, serpent-headed, and high upon the leg; their flesh dark, coarse, and chiefly adapted to soup. They are good layers, and being well fed produce large, substantial, and nutritious eggs; but these birds are too long-legged to be steady sitters.

6690. *The shackbag or Duke of Leeds breed*, was formerly in great repute, but is now nearly lost. It is sometimes to be met with at Wokingham (Oakingham), in Berkshire, and is so large, and the flesh so white, firm, and fine, as to afford a convenient substitute for the turkey.

6691. *The improved Spanish cock and hen* is a cross between the Dorking and Spanish breed, also to be found in and around Wokingham. It is a large bird with black plumage, white and delicate flesh, the largest eggs of any British variety, and well adapted for capons.

6692. *Breeding.* The common variety is easily procurable; but the others must either be procured from those parts of the country where they are usually bred, or from the poulterers and bird fanciers in large towns, and especially in London. It should be a general rule to breed from young stock; a two-year-old cock, or stag, and pullets in their second year. Pullets in their first year, if early birds, will indeed, probably lay as many eggs as ever after; but the eggs are small, and such young hens are unsteady sitters. Hens are in their prime at three years of age, and decline after five, whence, generally, it is not advantageous to keep them beyond that period, with the exception of those of capital qualifications. Hens with a large comb, or which crow like the cock, are generally deemed inferior; but I have had hens with large rose combs, and also crows, which were upon an equality with the rest of the stock. Yellow-legged fowls are often of a tender constitution, and always inferior in the quality of their flesh, which is of a loose flabby texture, and ordinary flavor.

6693. *The health of fowls* is observable in the fresh and florid color of the comb, and the brightness and dryness of the eyes; the nostrils being free from any discharge, and the healthy gloss of the plumage. The most useful cock is generally a bold, active, and savage bird, cruel and destructive in his fits of passion, if not well watched, to his hens, and even to his offspring. Hens above the common size of their respective varieties, are by no means preferable either as layers or setters. The indications of old age are paleness of the comb and gills, dulness of color, and a sort of downy stiffness in the feathers, and length and size of talons, the scales upon the legs becoming large and prominent.

6694. *The number of hens to one cock* should be from four to six, the latter being the extreme number, with a view of making the utmost advantage. Ten and even twelve hens have been formerly allowed to one cock, but the produce of eggs and chickens under such an arrangement will seldom equal that to be obtained from the smaller number of hens. Every one is aware that the spring is the best season to commence breeding with poultry, and in truth it scarcely matters how early, presupposing the best food, accommodation, and attendance, under which hens may be suffered to sit in January.

6695. *The conduct of the cock towards his hens* is generally of the kindest description, and sometimes, as in the Polish breed, so remarkably so, as to be quite incredible to those who have not witnessed it. It is not an uncommon occurrence, however, for the cock to take an antipathy at some individual hen; when it continues for any length of time it is best to remove her, and supply her place by another, taking care that the stranger be not worried by the hens. Spare coops or houses will be found useful on such occasions.

6696. *The change of a cock*, from death or accident, is always attended with interruption and delay, as it may be some considerable time before the hens will associate kindly with their new partner; and further, a new cock may prove dull and inactive from the change, however good in nature. This frequently happens with cocks of the superior breeds, purchased from the London dealers, in whose coops they have been kept in such a high state of temperature, that they are unable to endure the open air of the country, unless in the summer season. Such being removed in autumn, winter, or early in spring, if immediately turned abroad with hens, are liable to become aguish, torpid, and totally useless; perhaps, in the end, turning rousy or glandered. The only method of safety in this case, is to keep such a cock in the house, upon the best and most nourishing food, turning the hens to him several times in the day, and permitting him to be abroad an hour or so, the weather being fine, until in a few weeks, he shall be accustomed to the air.

6697. *In making the nests*, short and soft straw is to be preferred, because, the straw being long, the hen, on leaving her nest, will be liable to draw it out with her claws, and with it the eggs. The hen, it is ascertained, will breed and lay eggs, without the company of a cock; in course, such eggs are barren.

6698. *Eggs for setting* should never exceed the age of a month, the newer to be preferred, as nearly of a size as possible, and of the full middle size; void of the circular flaw, which indicates the double yolk, generally unproductive, nor should there be any roughness or cracks in the shells. The number of eggs, according to the size of the hen, from nine to fifteen, an odd number being preferable, on the supposition of their lying more close. The eggs to be marked with a pen and ink, and examined when the hen leaves her nest, in order to detect any fresh ones which she may have laid, and which should be immediately taken from her, as they, if at all, would be hatched too late for the brood. It is taken for granted the box and nest have been made perfectly clean for the reception of the hen, and that a new nest has not been sluggishly or sluttishly thrown upon an old one, from the filth of which vermin are propagated, to the great annoyance of the hen, and prevention of their steady sitting. Eggs broken in the nest, should be cleared away the instant of discovery, and the remaining washed with warm water, and quickly replaced, lest they adhere to the hen, and be drawn out of the nest; if necessary, the hen's feathers may also be washed, but always with warm water.

6699. With respect to the *capriciousness of some hens*, in the article of sitting, it is a risk which must be left to the judgment of the attendant, who has to determine whether the hen which appears desirous of sitting, may be safely trusted with eggs. Leaving a number of eggs in the nest is an enticement. Very frequently, a hen will cluck, and appear hot for incubation, yet after sitting over her eggs a sufficient number of hours to addle them, will then desert them: and, probably, in the course of a few days will be taken with another fit of incubation. Much useless cruelty is too often exercised, to prevent the hen

from sitting, when eggs, rather than chickens, are in request. A late author recommends to thrust a feather through the hen's nostrils, in order to prevent her from sitting: and to give her half a glass of gin, then swing her round until seemingly dead, and confine her in a pot, during a day or two, leaving her only a small breathing hole, to force her to sit! It is full time that those and a hundred other such utterly useless and barbarous follies of former days, practised upon various animals, should be dismissed with the contempt they merit. The pamphlet alluded to, is the *Epicure*, by Thomas Young, a publication replete with good things on the interesting subjects of eating, wines, spirits, beer, cider, &c. It is written with *hand good*. (Mowbray.)

6700. *Moulting.* Every succeeding year after the third, the hen continues to moult later in the season, and laying fewer or no eggs during the moulting period, which is sometimes protracted to two or three months. It should seem that old hens are seldom to be depended upon for eggs in the winter, such being scarcely full of feather until Christmas; and then, probably, may not begin to lay till April, producing at last, not more than twenty or thirty eggs. In general, it is most profitable to dispose of hens whilst they are yet eatable or saleable for that purpose, which is in the spring of the third year. Nor do delicate white hens lay so many eggs in the cold season, as the more hardy colored varieties, requiring warmth and shelter, particularly by night. Moulting, or the casting and renewal of feathers, lasts with its effects from one to three months, according to the age and strength of the bird. Whilst under this natural course, poultry are unfit for the table, as well as for breeding. It is the same with respect to young poultry, whilst shedding their feathers in the spring. The regular moulting of full-grown fowls begins in the autumn.

6701. *In some hens the desire of incubation* is so powerful that they will repeat it five or six times in the year; in others it is so slight, that they will probably not sit more than once or twice in the season. A skilful breeder will take advantage of these qualities, and provide abundance of eggs from the one variety, and of chickens by means of the other. Hens when sitting drink more than usual, and it is an advisable practice to place water constantly before them when in this state, and food (say corn) at least twice a day. The time of incubation is twenty-one days.

6702. *Hatching.* The chicken, hitherto rolled up like a ball, with its bill under the right wing like a bird asleep, begins generally on the morning of the twenty-second day to break its way through the shell, neither the hen, nor can the art of man, with safety render them aid in this very interesting and wonderful operation. The parental affection of the hen, as Mowbray and Parmentier have observed, is always intensely increased, when she first hears the voice of the chicks through the shells, and the strokes of their little bills against them. The signs of a need of assistance, the former author observes, are, the egg being partly pecked, and the efforts of the chicken discontinued for five or six hours. The shell may then be broken cautiously, and the body of the chicken carefully separated from the viscous fluid which lines it. Reaumur gives it as his opinion, that no aid ought to be given to any chickens but those which have been near twenty-four hours employed without getting forward in their work.

6703. *The chickens first hatched* should be taken from the hen, least she be tempted to leave her task unfinished. Those removed, may be secured in a basket of wool or soft hay, and kept in a moderate heat, if the weather be cold, near the fire. They will require no food for many hours, even four and twenty, should it be necessary to keep them so long from the hen. The whole brood being hatched, the hen is to be placed under a coop abroad, upon a dry spot, and, if possible, not within reach of another hen, since the chickens will mix, and the hens are apt to maim or destroy those which do not belong to them. Nor should they be placed near numbers of young fowls, which are likely to crush young chicks under their feet, being always eager for the chickens' meat. The first food should be split grits, afterwards tail wheat; all watery food, soaked bread, or potatoes, improper. Eggs boiled hard, or curd chopped small, are much approved as first food. Their water should be pure and often renewed, and there are convenient pans made in such forms, that the chickens may drink without getting into the water, which often, by wetting their feet and feathers, numbs and injures them; a basin whelmed in the middle of a pan of water, will answer the end, the water running round it generally; and independent on situation, and the disposition of the hen, there is no necessity for cooping the brood beyond two or three days, but they may be confined as occasion requires, or suffered to range, as they are much benefitted by the scratching and foraging of the hen. They must not be let out too early in the morning, or whilst the dew remains upon the ground, far less be suffered to range over the wet grass, one common and fatal cause of disease. Another caution is of the utmost consequence, to guard them watchfully against sudden unfavorable changes of the weather, more particularly if attended with rain. Nearly all the disorders of gallinaceous fowls arise from cold moisture.

6704. *For the period of the chickens quitting the hen*, there is no general rule, the most certain is, when the hen begins to roost, leaving them; if sufficiently forward, they will follow her, if otherwise, they should be secured in a proper place, the time having

arrived when they are to associate with the young poultry, as nearly of their own age and size as possible, since the larger are apt to overrun and drive from their food the younger brood.

6705. *Hatching by artificial heat* is an Egyptian practice, mentioned by Diodorus and Aristotle, and was brought into notice about the middle of the eighteenth century, by Reaumur in his "*Art de faire éclore &c. des Oiseaux domestiques*." The requisite degree of heat is 90 degrees, which is supplied by fire, steam, or fermentible substances; after hatching, the birds are placed in a cage, in which is placed a lamb-skin suspended from the roof of a box, and enclosed by a curtain of green baize; or, according to Parmentier, they may be placed under a capon, who after being prepared for receiving pleasure from feeling the chickens under its belly, by depriving it of the greater part of the feathers and excoriation, is to be confined with them in the same coop, and after being fed together for a day or two, it is said the capon will become an excellent nursing mother. Excepting as matter of curiosity, however, it is not at present worth while either to hatch or rear chickens artificially in this country. Whether Reaumur's mode of hatching be adopted, or Mrs. D'Oyley's of depriving hens of their chickens as soon as hatched, and thus causing one hen to hatch five or six broods in succession, the human attention required, and the risk of failure are so great, that the surest modes, under all the present circumstances, are such as are natural. Where it is tried for experiment or curiosity, the heat of tan or dung is more likely to prove steady, than that from smoke, air, or steam. An enclosure in the middle of a broad viney or hot-house might serve at once to hatch and rear early chickens; and such a mode of rearing, at least in the winter season, certainly deserves the attention of those who are curious in having this luxury in February and March.

6706. *The products of the cock and hen* are eggs, feathers, and the carcase.

6707. *Eggs* become desiccated, and, in consequence, lose great part of their substance and nutritive quality, by keeping, and every body knows the value of a fresh-laid egg. They will retain their moisture and goodness, however, three or four months, or more, if the pores of the shell be closed and rendered impervious to the air, by some unctuous application. We generally anoint them with mutton suet melted, and set them on end, wedged close together, in bran, *stratum super stratum*, the containing box being closely covered. Laid upon the side, the yolk will adhere to the shell. They thus come into use, at the end of a considerable period of time, in a state almost equal to new-laid eggs, for consumption, but ought not to be trusted for incubation, excepting in the case of the imported eggs of rare birds.

6708. *The largest eggs* will weigh two ounces and a half, those of the Chittagong hen, perhaps, three ounces. To promote fecundity and great laying in the hen, nothing more is necessary than the best corn and fair water; malted or sprouted barley has occasionally a good effect, whilst the hens are kept on solid corn; but if continued too long they are apt to scour. Cordial horse-ball is good to promote laying in the cold season, and also toast and ale, as every hen-wife well knows. It must be noted, that nothing is more necessary towards success in the particular of obtaining plenty of eggs, than a good attendance of cocks, especially in the cold season; and it is also especially to be observed, that a cock whilst moulting is generally useless. Buffon says, a hen well fed and attended will produce upwards of one hundred and fifty eggs in a year, besides two broods of chickens. Mowbray observed, that a hen generally cackled three or four days previously to laying; and that some half-bred game hens began to lay as soon as their chickens were three weeks old; the consequence of high keep and good attendance of the cocks.

6709. *Feathers or down* intended for use, should be plucked as soon as possible after the bird is dead, and before it is cold, otherwise they are defective in that elasticity which is their most valuable property, and are liable to decay. The bird should, beside, be in good health, and not moulting, for the feathers to be in perfection; and being plucked, and a sufficient number collected, the sooner they are dried upon the oven, the better, since they are else apt to heat and stick together.

6710. *Where hens are kept more than a year* they are sometimes plucked towards the end of the spring season for the sake of their feathers. This operation, where it takes place, ought to be performed in the most tender and careful manner, and the birds housed afterwards for a time sufficient to enable them to endure the air: but the practice is cruel, and we trust it is not likely to come into general use.

6711. *Feeding and fattening the carcase.* Fowls will become fat on the common run of the farm-yard, where they thrive upon the offals of the stable, and other refuse, with perhaps some small regular daily feeds; but at threshing time, they become particularly fat, and are thence styled barn-door-fowls, probably the most delicate and high flavored of all others, both from their full allowance of the finest corn, and the constant health in which they are kept, by living in a natural state, and having the full enjoyment of air and exercise. They are also confined during a certain number of weeks, in coops, those fowls which are soonest ready being drawn as wanted. It is a common practice with some house-wives, to coop their barn-door fowls for a week or two, under the notion of improving them for the table, and increasing their fat; a practice which, however, seldom succeeds, since the fowls generally pine for their loss of liberty, and slighting their food, lose instead of gaining additional flesh. Such a period, in fact, is too short for them to become accustomed to confinement.

6712. *Feeding-houses*, should be warm and airy, with earth floors well raised, and capacious enough to accommodate twenty or thirty fowls; the floor slightly littered down, and the litter often changed. Sandy gravel and a little lime rubbish should be placed in different places, and often changed. A sufficient number of troughs, for both water and food, should be placed around, that the stock may feed with as little interruption as possible from each other, and perches in the same proportion should be furnished for those birds which are inclined to perch, which few of them will desire, after they have begun to fatten, but which helps to keep them easy and contented until that period. In this

mode fowls may be fattened to the highest pitch, and yet preserved in a healthy state, their flesh being equal in quality to that of the barn-door fowl. To suffer fattening fowls to perch, is contrary to the general practice, since it is supposed to bend and deform the breast-bone; but as soon as they become heavy and indolent from feeding, they will rather incline to rest in the straw; and the liberty of perching in the commencement of their cooping, has a tendency to accelerate that period, when they are more inclined to rest on the floor. Fowls, moreover, of considerable growth, will have many of them become already crooked breasted from perching whilst at large, although much depends upon form in this case, since we find aged cocks and hens of the best shape, which have perched all their lives with the breast bone perfectly straight.

6713. *The privation of light*, by inclining fowls to a constant state of repose, excepting when moved by the appetite for food, promotes and accelerates obesity; but a state of obesity obtained in this way cannot be a state of health, nor can the flesh of animals so fed, equal in flavor, nutriment, and salubrity, that of the same species fed in a more natural way. Economy and market interest may perhaps be best answered by the plan of darkness and close confinement; but a feeder for his own table, of delicate taste, and ambitious of furnishing his board with the choicest and most salubrious viands, will declare for the natural mode of feeding; and in that view, a feeding-yard, gravelled and turfed, the room being open all day, for the fowls to retire at pleasure, will have a decided preference, as the nearest approach to the barn-door system.

6714. *Insects and animal food* form a part of the natural diet of poultry, are medicinal to them in a weakly state, and the want of such food may sometimes impede their thriving.

6715. *For fattening the younger chickens*, the above feeding room and yard is well calculated. These may be put up as soon as the hen shall have quitted her charge, and before they have run off the sucking flesh. For generally when well kept and in health, they will be in fine condition and full of flesh at that period, which flesh is afterwards expended in the exercise of foraging for food, and in the increase of stature, and it may be a work of some time afterwards to recover it, and more especially in young cocks, and all those which stand high upon the leg. In fact, all those which appear to have long legs, should be fattened from the hen, to make the best of them; it being extremely difficult, and often impossible, to fatten long-legged fowls in coops, which, however, are brought to a good weight at the barn-door.

6716. *In the choice of full-sized fowls for feeding*, the short-legged and early hatched always deserve a preference. The green linnet is an excellent model of form for the domestic fowl, and the true Dorking breed approaches the nearest to such model. In course the smaller breeds and the game are the most delicate and soonest ripe. The London chicken butchers as they are termed, or poulterers, are said to be of all others, the most dexterous feeders, putting up a coop of fowls and making them thoroughly fat within the space of a fortnight; using so much grease, and that perhaps not of the most delicate kind, in the food. In the common way, this business is often badly managed, fowls being huddled together in a small coop, tearing each other to pieces, instead of enjoying that repose which alone can ensure the wished-for object; irregularly fed and cleaned, until they are so stench and poisoned in their own excrement, that their flesh actually smells and tastes of it when smoking upon the table. Where a steady and regular profit is required from poultry, the best method, whether for domestic use or sale, is constant high keep from the beginning, whence they will not only be always ready for the table, with very little extra attention, but their flesh will be superior in juiciness and rich flavor, to those which are fattened from a low or emaciated state. Fed in this mode, the spring pullets are particularly fine, and at the same time most nourishing and restorative food. The pullets which have been hatched in March, if high fed from the nest, will lay plentifully through the following autumn, and not being intended for breeding stock, the advantage of their eggs may be taken, and themselves disposed of thoroughly fat for the table in February, about which period their laying will be finished. Instead of giving ordinary and tail corn to fattening and breeding poultry, it will be found most advantageous to allow the heaviest and best, putting the confined fowls upon a level with those fed at the barn door, where they have their share of the weightiest and finest corn. This high feeding shows itself not only in the size and flesh of the fowls, but in the size, weight, and substantial goodness of their eggs, which in those valuable particulars will prove far superior to the eggs of fowls fed upon ordinary corn or washy potatoes; two eggs of the former going further in domestic use than three of the latter. The water also given to fattening fowls should be often renewed, fresh, and clean; indeed, those which have been well fed, will turn with disgust from ordinary food and foul water.

6717. *Barley and wheat are the great dependence for chicken poultry*; oats will do for full grown hens and cocks, but are not so good as barley; both, when they have their fill of corn, will eat occasionally cabbage or beet leaves. Steamed potatoes and oatmeal

mixed together make an excellent mess, but must not be given in great quantities, otherwise it renders the flesh soft and flabby.

6718. *Cramming.* Barley and wheat meal are generally the basis or chief ingredient in all fattening mixtures for chickens and fowls; but in Sussex, ground oats are used, and these oats are in higher repute for fattening than elsewhere, many large hogs being fattened with them. In the report of that county, the Rev. Arthur Young says, "North Chappel, and Kinsford, are famous for their poultry. They are fattened there to a size and perfection unknown elsewhere. The food given them is ground oats made into gruel, mixed with hog's grease, sugar, pot-liquor, and milk: or ground oats, treacle, and suet, sheep's plucks, &c. The fowls are kept very warm, and crammed morning and night. The pot-liquor is mixed with a few handfuls of oatmeal and boiled, with which the meal is kneaded into crams or rolls of a proper size. The fowls are put into the coop, two or three days before they are crammed, which is continued for a fortnight; and they are then sold to the bigglers. These fowls, full grown, weigh seven pounds each, the average weight five pounds; but there are instances of individuals double the weight. They were sold at the time of the survey (1809.), at four to five shillings each. Turner, of North Chappel, a tenant of Lord Egremont, crams two hundred fowls per annum. Great art and attention is requisite to cut the capons, and numbers are destroyed in the operation."

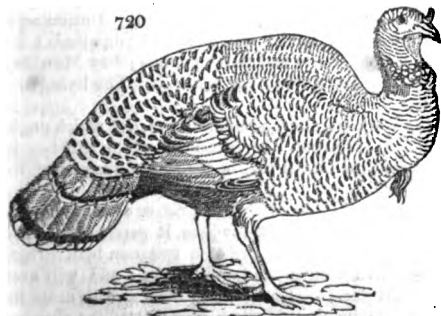
6719. *Oakingham in Berks.* is particularly famous for fatted fowls, by which many persons in that town and vicinity gain a livelihood. The fowls are sold to the London dealers, and the sum of 150*l.* has been returned in one market day by this traffic. Twenty dozen of these fowls were purchased for one gala at Windsor, after the rate of half a guinea the couple. At some seasons, fifteen shillings have been paid for a couple. Fowls constitute the principle commerce of the town. Romford, in Essex, is also a great market for poultry, but generally of the store or barn-door kind, and not artificially fed.

6720. *The Oakingham method of feeding* is to confine the fowls in a dark place, and cram them with paste made of barley-meal, mutton-suet, treacle, or coarse sugar, and milk, and they are found completely ripe in a fortnight. If kept longer, the fever that is induced by this continued state of repletion, renders them red and unsaleable, and frequently kills them. Geese are likewise fed in the same neighborhood, in great numbers, and sold about Midsommer to itinerant dealers, the price at the time the survey was made (1808.), two shillings, to two and three-pence each. It appears utterly contrary to reason, that fowls fed upon such greasy and impure mixtures, can possibly produce flesh or fat so firm, delicate, meat flavored, or nourishing, as those fattened upon more simple and substantial food; as for example, meal and milk, without the addition of either treacle or sugar. With respect to grease of any kind, its chief effect must be to render the flesh loose and of indelicate flavor. Nor is any advantage gained, excluding the commercial one.

6721. *The methods of cramming by confining in a box* the size of the body of the fowl, and allowing its head and vent to project, for intromission and ejection; or of blinding the bird for this purpose; or of nailing it to the board; and also the mode of forcing down liquid food by a particular kind of pump, worked by the foot of the feeder, all these and other cruel practices we wish we could abolish in practice, and obliterate from the printed page.

6722. *Castration* is performed on cocks and hens only in some districts, and chiefly in Berkshire and Sussex. The usual time is when they have left the hen, or when the cocks begin to crow, but the earlier the better. It is a barbarous practice and better omitted. Capons are shunned both by hens and cocks, who it is said will not roost on the same perch with them. The Chinese mode of making capons is fully described and illustrated with cuts in the *Farmer's Magazine*, vol. vi. p. 46.

6723. *Pinioning of fowls* is often practised to restrain them from roosting too high, or from flying over fences, &c.; and is much more convenient than the cutting their wing feathers only. But in the ordinary methods of merely excising the pinion, it is frequently fatal; and almost always so to full grown birds or fowls, by their bleeding to death. To prevent this in the long-winged tribes, as ducks, geese, &c., pass a threaded needle through their wing, close by the inside of the smaller bone, (fig. 719 a), and making a ligature with the thread across the larger bone, and returning it on the outside of all, the principal blood vessels are secured, which could not be accomplished by a ligature confined to the surface only. After the blood vessels have been thus secured, cut off the



portion of wing beyond the ligature with scissors or shears. In the gallinacea or short winged tribes, as cocks, hens, &c., the operation is rendered safer, by being performed on the beginning of the next joint (b), making the ligature embrace all the vessels between these two bones by passing it twice through, and securing each bone individually, and passing the ligature around the whole of that part of the wing generally. In this way also birds which have been accidentally winged in shooting may be preserved.

6724. The turkey, (*Meleagris gallinavo*, L., fig. 720.) is a native of America, and

was introduced into this country from Spain soon after the discovery of the former country. The color in the wild state is black, but domestication has produced great variety. In a state of nature they are said to parade in flocks of five hundred, feeding, in general, where abundance of nettles are to be found, the seed of which, and of a small red acorn is their common food in the American woods. They get fat in a wild state, and are soon run down by horses and dogs. They roost on the highest trees, and since the clearing of extensive tracts in America, have become rare in many places: their antipathy to any thing of a red color is well known. In this country they are supposed to be of a tender constitution, which only applies to them when young, for when grown up they will live in the woods with occasional supplies of food, as is actually the case to a great extent in the demesne lands of the Marquis of Bute in Bute.

6725. The *varieties* are few, and chiefly the copper white, said to be imported from Holland, the former too tender for general culture; and the black Norfolk, esteemed superior to all others.

6726. *Breeding.* One turkey cock is sufficient for six hens or more, and a hen will cover according to her size from 9 to 15 eggs. The hen is apt to form her nest abroad in a hedge, or under a bush, or in some insecure place; she lays from eighteen to twenty-five eggs, or upwards, and her term of incubation is thirty days. She is a steady sitter, even to starvation, and therefore requires to be regularly supplied with food and water. Buffon says she is a most affectionate mother; but Mowbray observes that from her natural heedlessness and stupidity, she is the most careless of mothers, and being a great traveller herself, will drag her brood over field, heath, or bog, never casting a regard behind her to call in her straggling chicks, nor stopping while she has one left to follow her. The turkey differs from the common hen in never scratching for her chicks, leaving them entirely to their own instinct and industry, neither will they fight for their brood, though vigilant in the discovery of birds of prey, when they will call their chickens together by a particular cry, and run with considerable speed. Hence, when not confined within certain limits, they require the attendance of a keeper.

6727. *Turkey chicks* should be withdrawn from the nest as soon as hatched, and kept very warm by wrapping them in flannel, or putting them under an artificial mother in a warm room or other warm place. Various nostrums are recommended to be given and done at this season, as a peppercorn, and a tea spoonful of milk, immersion in cold water, &c. Mowbray wisely rejected all these unnatural practices, and succeeded by giving curd and hard eggs, or curd and barley meal kneaded with milk, and renewed with clear water rather than milk, as he found the last often scoured them. A sort of vermiceli, or artificial worms, made from pulling boiled meat into strings, he found beneficial for every species of gallinaceous chicken. Two great objects are to avoid superfluous moisture, and to maintain the utmost cleanliness, for which purposes as little slop food is given as possible. A fresh turf of short sweet grass should be daily given as green food, but not snails or worms, as scouring, and no oats; nettle seed, clover, rue, or wormwood gathered, as recommended by the elder housewives. Water is generally preferable to milk. When the weather is favorable, the hen is cooped abroad in the forenoon. During the rest of the day and night, for the first six weeks, she is kept within doors. After this the hen may be cooped a whole day externally for another fortnight, to harden the chickens; and afterwards they may be left to range within certain limits, or tended by an old man or woman, being fed at going out in the morning and returning in the evening. Their ordinary food may be that of the common cocks and hens. They will prefer roosting abroad upon high trees in the summer season, but that cannot generally be permitted with a view to their safe keeping.

6728. *Fattening.* Sodden barley, or barley and wheat-meal mixed, is the most approved food; and the general mode of management is the same as that of the common cock and hen. They are generally fed so as to come in at Christmas, but they may be fattened early or late. Sometimes, though but rarely, they are caponized. Buffon says, the wild turkey of America has been known to attain the weight of sixteen pounds; the Norfolk turkeys are said sometimes to weigh twenty and thirty pounds; but Mowbray says, he never made any higher than fifteen pounds ready for the spit. The living and dead weight of a turkey are as 21 to 14.

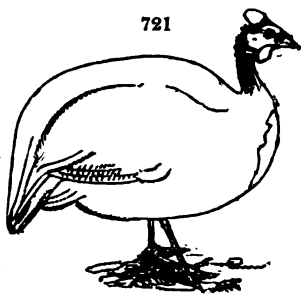
6729. *Feathers.* Turkeys are sometimes plucked alive, a barbarous practice which ought to be laid aside. Parmentier proposed to multiply the breed of white turkeys in France, and to employ the feathers found on the lateral part of the thighs, instead of the plumes of the ostrich.

6730. *The Guinea hen* (*Numidia meleagris* L. Ag. 721.), is a native of Guinea, and found in various parts of South America, where it perches on palm-trees, and builds its nest in the palm-tree. It is of a size of a common hen, and is very voracious, and often found in large flocks attack the turkey, though so much inferior in the properties of the pheasant and the

than that of the common cock and hen both in color and taste, and is reckoned a very good substitute for the former bird. It is also very prolific, and its eggs are nourishing and good. It assimilates perfectly with common fowls in its artificial habits and kinds of food; but it has this peculiarity—that the cocks and hens are so nearly alike, that it is difficult to distinguish them, and it has a peculiar gait, and cry, and chuckle.

6731. *The peacock (Pavo cristatus, L.)* is a native of India, and found in a wild state in Java and Ceylon, where they perch on trees like the turkey in America. The age of the peacock extends to twenty years, and at three the tail of the cock is full and complete. The cock requires from three to four hens; and where the country agrees with them, they are very prolific, a great ornament to the poultry-yard and lawn, and useful for the destruction of all kinds of reptiles. Unfortunately, they are not easily kept within moderate bounds, and are very destructive in gardens. They live on the same food as other domestic fowls, and prefer barley. They are in season from February till June; but though a peacock forms a very showy dish, the flesh is ill-colored and coarse, and they are therefore kept more as birds of ornament than of use.

721



SECT. III. *Anserine, or Aquatic Fowls.*

6732. The order *anser* comprehends the duck, goose, swan, and buzzard. Under a regular system, Mowbray observes, it would be preferable to separate entirely the aquatic from the other poultry, the former to have their houses ranged along the banks of a piece of water, with a fence, and sufficiently capacious walks in front; access to the water by doors to be closed at will. Should the water be of considerable extent, a small boat would be necessary, and might be also conducive to the pleasure of angling.

6733. *The duck (Anas boschus, L., fig. 722.)* is a native of Britain, and found frequenting the edges and banks of lakes in most parts of Europe. The flesh of this and various other species of the duck is savory and stimulant, and said to afford preferable nourishment to that of the goose, being less gross, and more easily digested. The flesh of the wild duck, though more savory than that of the tame, is reckoned still more easy of digestion. The ancients went even beyond our greatest modern epicures in their high esteem for the flesh of the duck, and Plutarch asserts, that Cato preserved his whole household in health by dieting them on duck's flesh.

6734. *Varieties and species.* There are the *Rhone*, the *Aylesbury*, the *Canvass-backed*, and the *Muscovy*.

6735. *The Rhone duck* is originally from France, and generally of a dark-colored plumage, large size, and supposed to improve our breed. They are of darker flesh, and more savory than the English duck; but somewhat coarse. Rhone-ducks have been so constantly imported for a great number of years, that they are very generally mixed with our native breed. The English duck, particularly the white variety, especially when they chance to have light-colored flesh, are never of so high and savory flavor as the darker colors. Muscovy and other foreign species of the duck, are kept rather out of curiosity than for the table.

6736. *The white Aylesbury* are a beautiful and ornamental stock, matching well in color with the Embden geese. They are said to be early breeders.

6737. *The canvass-backed*, bred only on the Potowmac and Susquehanna rivers, are of very recent introduction from America, and are only to be found in a few places near Liverpool; they are said to be the best in the world, and if so will soon become better known.

6738. *The Muscovy duck (A. Moschata, L.)*, is a native of Brazil, but domesticated in Europe. It is a curious dark-colored bird, distinguished by its naked face, kept more out of curiosity than use; to be retained in any place, they must be reared there from the egg, otherwise they will fly away.

6739. *Breeding.* One drake is generally put to five ducks; the duck will cover from eleven to fifteen eggs, and her term of incubation is thirty days. They begin to lay in February, are very prolific, and are apt, like the turkey, to lay abroad, and conceal their eggs, by covering them with leaves or straws. The duck generally lays by night, or early in the morning; white and light-colored ducks produce similar eggs, and the brown and dark-colored ducks, those of a greenish blue color, and of the largest size. In setting ducks, it is considered safest to put light-colored eggs under light ducks, and the

contrary; as there are instances of the duck turning out with her bill those eggs which were not of her natural color.

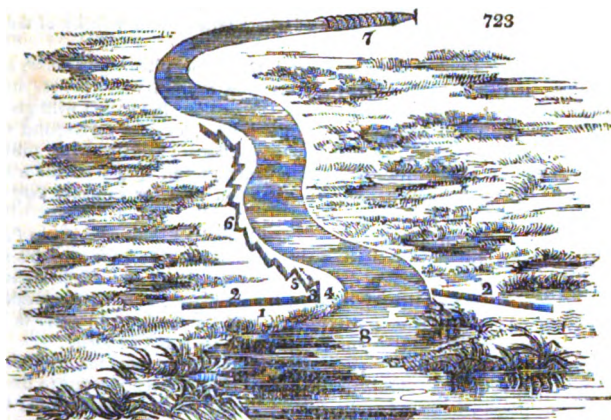
6740. During *incubation*, the duck requires a secret and safe place, rather than any attendance, and will, at nature's call, cover her eggs, and seek her food, and the refreshment of the waters. On hatching, there is not often a necessity for taking away any of the brood, barring accidents; and having hatched, let the duck retain her young upon the nest her own time. On her moving with her brood, prepare a coop upon the short grass, if the weather be fine, or under a shelter, if otherwise: a wide and flat dish of water, often to be renewed, standing at hand; barley, or any meal, the first food. In rainy weather particularly, it is useful to clip the tails of the ducklings, and the surrounding down beneath, since they are else apt to drizzle and weaken themselves. The duck should be cooped at a distance from any other. The period of her confinement to the coop, depends on the weather and the strength of the ducklings. A fortnight seems the longest time necessary; and they may be sometimes permitted to enjoy the pond at the end of a week, but not for too great a length at once, least of all in cold wet weather, which will affect, and cause them to scour and appear rough and draggled. In such case they must be kept within a while, and have an allowance of bean or pea-meal mixed with their ordinary food. The meal of buck-wheat and the former is then proper. The straw beneath the duck should be often renewed, that the brood may have a dry and comfortable bed; and the mother herself be well fed with solid corn, without an ample allowance of which, ducks are not to be reared or kept in perfection, although they gather so much abroad.

6741. *Duck eggs are often hatched by hens*, when ducks are more in request than chickens; also as ducks, in unfavorable situations, are the more easy to rear, as more hardy; and the plan has no objection in a confined place, and with a small stock, without the advantage of a pond; but the hen is much distressed, as is sufficiently visible, and, in fact, injured, by the anxiety she suffers in witnessing the supposed perils of her children venturing upon the water.

6742. *Ducks are fattened*, either in confinement, with plenty of food and water, or full as well restricted to a pond, with access to as much solid food as they will eat; which last method is preferable. They fatten speedily, in this mode, mixing their hard meat with such a variety abroad as is natural to them, more particularly, if already in good case; and there is no check or impediment to thrift from pining, but every mouthful tells and weighs its due weight. A dish of mixed food is preferable to white corn, and may remain on the bank, or rather in a shed, for the ducks. Barley, in any form, should never be used to fatten ducks or geese, since it renders their flesh loose, woolly, and insipid, and deprives it of that high savory flavor of brown meat, which is its valuable distinction; in a word, rendering it chickeny, not unlike in flavor the flesh of ordinary and yellow-legged fowls. Oats, whole or bruised, are the standard fattening material for ducks and geese, to which may be added pea-meal, as it may be required. The house-wash is profitable to mix up their food, under confinement; but it is obvious, whilst they have the benefit of what the pond affords, they can be in no want of loose food. Acorns in season, are much affected by ducks which have a range; and they will thrive so much on that provision, that the quantity of fat will be inconvenient, both in cooking, and upon the table. Ducks so fed, are certainly inferior in delicacy, but the flesh eats high, and is far from disagreeable. Fed on butcher's offal, the flesh resembles wild fowl in flavor, with, however, considerable inferiority. Offal-fed duck's flesh does not emit the abominable stench which issues from offal-fed pork. When live ducks are plucked, only a small quantity of down and feathers should be taken from each wing.

6743. *Decoys for wild ducks*. Wild ducks, and other aquatic birds, are frequently taken by the device termed a decoy, which, in the low parts of Essex, and some other marshy districts, may be considered as connected with husbandry. A decoy is a canal or ditch, provincially pipe, of water (*fig. 723.*), with a grassy sloping margin (1) at its junction with a river or larger piece of water (8), to invite aquatic fowls to sit on and dress their plumage; but in other parts, covered with rushes and aquatic plants for concealment. Along the canal of the decoy are placed reed fences (2, 2), to conceal the decoy-man and his dogs from the sight of the ducks. There is an opening in this fence (3), where the decoy-man first shows himself to the birds to force them to take the water; and having taken it, the dog drives them up the canal, the man looking through the fence at different places (4, 5, 6) to frighten them forward. At the end of the canal is a tunnel net (7), where the birds are finally taken. In operating with this trap, as the wild duck is a very shy bird, and delights in retirement, the first step is to endeavor to make the given water a peaceful asylum, by suffering the ducks to rest on it undisturbed. The same love of concealment leads them to be partial to waters whose margins are abundant with underwood and aquatic plants; hence, if the given water is not already furnished with these appendages, they must be provided; for it is not retirement alone which leads them into these recesses, but a search after food also. At certain

times of the day, when wild fowl are off their feed, they are equally delighted with a smooth, grassy margin, to adjust and oil their plumage upon. On the close-



pastured margins of large waters, frequented by wild fowl, hundreds may be seen amusing themselves in this way; and perhaps nothing draws them sooner to a water than a convenience of this kind: hence, it becomes essentially necessary to success, to provide a grassy, shelving, smooth-shaven bank (1) at the mouth of the decoy, in order to draw the fowl, not only to the water at large, but to the desired part of it. Having, by these means, allured them to the mouth of the decoy; the difficulties that remain are, those of getting them off the bank into the water, without taking wing, and of leading them up the canal to the snare which is set for them in the most easy manner.

6744. In order to get them off the bank into the water, a dog is necessary (the more like a fox the better), which should steal from behind the skreen of reeds, (2, 3,) which is placed by the side of the canal to hide the decoy-man as well as his dog, until the signal be given. On seeing the dog, the ducks rush into the water; where the wild fowl consider themselves as safe from the enemy which had assailed them, and of course do not take wing. Among the wild fowl, a parcel (perhaps eight or ten) of decoy-ducks should be mixed, which will probably be instrumental in bringing them, with greater confidence, to the bank. As soon as these are in the water, they make for the decoy, at the head of which they have been constantly fed, and in which they have always found an asylum from the dog. The wild ducks follow; while the dog keeps driving behind; and, by that means, takes off their attention from the trap they are entering. When, as soon as the decoy-man, who is all the while observing the operation through peep-holes in the reed skreen, sees the entire shoal under a canopy net which covers and incloses the upper part of the canal, he shews himself, when the wild fowl instantly take wing, but their wings meeting with an impervious net, instead of a natural canopy, formed of reeds and bulrushes, they fall again into the water, and, being afraid to recede, the man being close behind them, they push forward into the tail of the tunnel net, which terminates the decoy. In this way, nine dozen have been caught at a time.

6745. The form of the pipe or canal ought to resemble the outlet of a natural brook, or a natural inlet or creek of the principal water. The mouth ought to be spacious, and free from confinement, that the wild fowl, on their first rushing into the water, and while they have yet the power of recollection, may be induced to begin to follow the tame ducks; and for the same purpose it ought to be crooked, that its inward narrowness, and the nets, may not, in the first instance, be perceived. The lower part of a French horn is considered as the best form of the canal of a decoy that can be had. A material circumstance remains yet to be explained. It is the invariable nature of wild fowl to take wing with their heads toward the wind; and it is always imprudent to attempt to take them in a decoy, unless the wind blow down the pipe; for, while their enemy is to leeward of them, they have less scruple to go up the pipe, making sure of an escape by their wings. But, what is of still more consequence, if the wind set up the pipe when they take wing under the canopy net, some of them would probably escape (a circumstance always to be dreaded), and those which fell again into the water, would fall, of course, with their heads toward the wind, and would, with greater difficulty, be driven into the tunnel. This point is so well known by decoy-men in general, that every decoy is, when circumstances will admit of it, furnished with three or four different canals, pointing to distinct quarters of the horizon, that no opportunity may be lost on account of the wind being in any particular point.



6746. The goose (*Anas anser*, L., fig. 724.) is a native of Britain, and most parts of the north of Europe, but less common than the duck. The flesh of the common and various species of geese is highly stimulant, strong in flavor, viscous, and of a putrescent tendency. The flesh of the tame goose is more tender than that of the wild, which tastes of fish, but either kind is only adapted for good stomachs, and powerful digestion, and should be sparingly used by the sedentary and weak, or persons subject to cutaneous diseases. The fat of the goose is reckoned peculiarly subtle, penetrating, and resolvent, and is generally carefully preserved for domestic applications. The goose attains to a great age,

well authenticated instances being on record to the extent of 70 and 80 years. The best geese in England are probably to be found on the borders of Suffolk and Norfolk, and in Berkshire; but the greatest numbers are in Lincolnshire, whence they are sent in droves to London to be fed by the poulterers, some of whom fatten in the vicinity of the metropolis above five thousand in a season.

6747. *Of varieties and species* there are several, the former differing in color, as black, white, and grey, and also in size. There is also the Spanish white goose, and large white Embden goose, the latter in most esteem. When one has seen a wild goose, says Pennant, a description of its plumage will, to a feather, exactly correspond with any other. But in the tame kinds, no two of any species are exactly alike; different in their size, their colors, and frequently in their general form, they seem the mere creatures of art; and having been so long dependent upon man for support, they seem to assume forms entirely suited to his necessities.

6748. There is a *Chinese species* (*A. cygnoides*), and an American goose (*A. canadensis*). The Chinese species is a domestic bird, but as yet little known in this country. It is longer and narrower in the body than the common goose, and stands higher on the legs. The Canadian goose is domesticated in several places, and is not considered uncommon in England. It is the most ornamental of the goose kind on water in pleasure grounds, and is abundant in the Duke of Devonshire's park at Chiswick.

6749. *Breeding.* One gander is generally put to five geese: the goose lays from eleven to fifteen eggs; and the period of incubation is from twenty-seven to thirty days. A nest should be prepared as soon as the female begins to carry straw in her bill, and by other tokens declares her readiness to lay. This is generally in March, and sometimes two broods are produced within the season, an advantage obtainable by high feeding through the winter with sound corn, and on the commencement of the breeding season allowing them boiled barley, malt, fresh grains, and fine pollard mixed up with ale or other stimulants. A good gander sits near his geese whilst they are sitting, and vigilantly protects them. Feeding upon the nest is seldom required; and it is unnecessary to take any of the goslings from the mother as hatched; but pen the goose and her brood at once upon dry grass well sheltered, putting them out late in the morning, or not at all in severe weather, and ever taking them in early in the evening. The first food may be similar to that recommended for the duck, such as barley meal, bruised oats, or fine pollard, with some cooling green vegetables, as cabbage or beet leaves intermixed.

6750. *Rearing.* At first setting at liberty, the pasturage of the goose should be limited, otherwise, if allowed to range over an extensive common, the gulls or goslings will become tired and cramped, and some of them will fall behind and be lost. Mowbray advises to destroy all the hemlock and nightshade in their range, and he says he has known them killed by swallowing sprigs of yew. As the young become pretty well feathered, they become also too large to be brooded beneath the mother's wing, and as they will then sleep in groups by her side, they must be well supplied with straw beds, which they will convert into excellent dung. Being able, says Mowbray, to frequent the pond and range the common at large, the young geese will obtain their living, and few people, favorably situated, allow them any thing more, excepting the vegetable produce of the garden. But it has been his constant practice, always to dispense a moderate quantity of any solid corn or pulse at hand, to the flocks of store geese, both morning and evening, on their going out, and their return, together, in the evening more especially, with such greens as chanced to be at command: cabbage, mangel-wurzel leaves, lucern, tares, and occasionally sliced carrots. By such full keeping his geese were ever in a fleshy state, and attained a large size; the young ones were also forward and valuable breeding stock. Geese managed on the above mode, will be speedily fattened green, that is, at a month or six weeks old, or after the run of the corn stubbles. Two or three weeks after the latter, must be sufficient to make them thoroughly fat. A goose fattened entirely on the stubbles, is to be preferred to any other; since an over-fattened goose is too much in the oil-cake and grease-tub style, to admit even the ideas of delicacy, tender firmness, or true flavor. But when needful to fatten them, the feeding-houses already recommended for hens (6712.) are most convenient. With clean and renewed beds of straw, plenty of clean water, oats, crushed or otherwise, pea or beam meal (the latter, however, coarse and ordinary food), or pollard mixed up with skimmed milk, geese will fatten pleasantly and speedily.

6751. *Feathers.* Pennant, in describing the methods used in Lincolnshire in managing geese, says, "they are plucked five times in the year; first at Lady-day for the feathers and quills, and four times for the feathers only, between that and Michaelmas." He says, he saw the operation performed on goslings of six weeks old, from which the feathers of the tails were plucked, and that numbers die of the operation, if the weather immediately afterwards proves cold. Lean geese furnish the greatest quantity of down

and feathers, and of the best quality. This seems a cruel practice, and surely were better left off.

6752. *The swan, (Anas olor, L., fig. 725.)* is a native of England, but not common; it is chiefly found on the Thames and the Trent. In former times the swan formed a dish of embellishment at great feasts; but now the cygnets, or young only are eaten, and that after a peculiar preparation. Formerly they were fattened at Norwich for the city feast, and commanded a guinea each. The foot of the swan possesses nearly the same property as that of the goose; and the skin was formerly held to contain medical properties. At present swans are chiefly to be considered as ornamental in pleasure grounds, clearing water from weeds, and occasionally affording cygnet and some swan down feathers and quills. It is a curious circumstance that the ancients considered the swan as a high delicacy, and abstained from the flesh of the goose as impure and indigestible.



6753. *Varieties or species.* The common swan differs in color; the black is rare, as every schoolboy knows. The swan goose, Muscovy goose (*A. hybrida, L.*), is a native of Guinea, and is a sort of middle species between the swan and the goose, and unites so well with the latter as to cause little or no perceptible difference in the progeny. They are sufficiently common in England, and distinguished by their erect gait, and the screaming which they continue during almost the whole day, without any obvious incitement.

6754. *Rearing.* The swan feeds like the goose, and has the same familiarity with its keepers, kindly and eagerly receiving bread which is offered, although it is a bird of courage equal to its apparent pride, and both the cock and hen are extremely dangerous to approach during incubation, or whilst their brood is young, as they have sufficient muscular force to break a man's arm with a stroke of their wing. They both labor hard in forming a nest of water plants, long grass, and sticks, generally in some retired part or inlet of the bank of the stream, or piece of water on which they are kept. The hen begins to lay in February, producing an egg every other day, until she has deposited seven or eight, on which she sits six weeks, although Buffon says it is nearly two months before the young are excluded. Swans' eggs are much larger than those of a goose, white, and with a hard, and sometimes tuberos shell. The cygnets are ash-colored when they first quit the shell, and for some months after; indeed, they do not change their color, nor begin to moult their plumage, until twelve months old, nor assume their perfect glossy whiteness, until advanced in their second year.

6755. *Feathers and down.* Where the living swan is plucked, only the ripe down should be taken from each wing, and four or five feathers. This may be repeated to the extent of three times in the course of a summer.

6756. *The bustard, (Otis tarda, L., fig. 726.),* is a native of England, the largest indigenous land bird in Europe; the cock generally weighing from twenty-five to twenty-seven pounds. The neck a foot long, the legs a foot and a half. It flies with some little difficulty. The head and neck of the cock ash-colored; the back barred transversely with black and bright rust color. The greater quill feathers black, the belly white; the tail, consisting of twenty feathers, marked with broad black bars: it has three thick toes before and none behind. There are upwards of half a dozen species of this bird, two or three of which (African) are crested. The little bustard (*O. letrax*), differs chiefly in size, not being larger than a pheasant. Bustards were known to the ancients in Africa, and in Greece and Syria; are supposed to

live about fifteen years; are gregarious, and pair in spring, laying only two eggs, nearly of the size of a goose-egg, of a pale olive brown, marked with spots of a darker hue. They sit about five weeks, and the young ones run, like partridges, as soon as delivered from the shell. The cocks will fight until one is killed or falls. Their flesh has ever been held most delicious; they are fed upon the same food as the turkey. There were formerly great flocks of bustards in this country, upon the wastes and in the wolds, particularly in Norfolk, Cambridgeshire, and Dorset, and in various parts of Scotland, where they were hunted with greyhounds, and were easily taken. Buffon was mistaken in his supposition that these birds are incapable of being propagated in the do-



domestic state, chiefly on account of the difficulty of providing them with proper food, which, in their wild state, he describes to be heath-berries and large earth-worms. Probably the haw or white-thorn berry might succeed equally well. To those who aim at variety and novelty in this line, the bustard appears peculiarly an object for propagation and increase, since the flesh is of unrivalled excellence; and it is probable this fowl will render great weight of flesh for the food consumed.

SECT. IV. Diseases of Poultry.

6757. *The diseases of poultry* are generally the result of improper nourishment and lodging, and the best mode of cure is by the immediate adoption of such as is proper. When that will not succeed, very little help can be derived from medical assistance; at least as that art stands at present with respect to poultry. In fact, as Mowbray observes, the far greater part of that grave and plausible account of diseases to be found in our common cattle and poultry books is a farrago of absurdity, the chief ground of which is random and ignorant guess-work.

6758. *Common fowls* are attacked by the pip, roup or catarrh, the flux, constipation, and vermin. The pip is an outside skin or scale, growing on the tip of the tongue, and is cured by tearing off the skin with the nail and rubbing the tongue with salt. Imposthume on the rump is called the roup, which term is also applied to catarrh, to which gallinaceous fowls are very subject. The imposthume is to be opened, the core thrust out, and the part washed with salt and water. Generous food and warmth is the only cure in the catarrh. The flux is to be cured with good solid food, and its opposite, constipation with scalded bran mixed with skim-milk or pot liquor, adding a small quantity of sulphur. Vermin appear in consequence of low keep, and want of cleanliness; the simplest remedy is to allow plenty of sand and ashes for the birds to roll in, and to keep their houses and roosts sweet and clean, white-washing them two or three times a year.

6759. But the *catarrh* is the chief disease to which chickens and fowls are liable; and when the malady becomes confirmed with running at the nostrils, swollen eyes, &c. they are termed *roupy*, and the disease is infectious. They should now be separated and kept in a warm apartment and well fed. Roupiness seldom lay, and their eggs are unwholesome. In chickens this disease is called the *chip*; they are constant shivering, pining, and dying in corners, apparently from cold, though they are in fact in a fever. Abundant warmth and rich food, are the only remedies.

6760. *Broken legs, wings, or toes*, may be set and spliced, and will recover; the head being raw and the eyes blinded from fighting, wash the eyes with milk and water, and the head alternately with brandy in which is a few drops of laudanum, and with fresh butter. A cock's spur being too long, impeding his walk and wounding his legs, they should be cut carefully with a sharp pen-knife, but not too near the quick, every three months.

6761. *Geese* are subject to the gangle, or stoppage in the head, the consequence of cold. House the patient, and give garlic beat up with fresh butter; or toast and ale with a little confinement will succeed equally well.

6762. *All poultry*, when young, are apt to be carried off by rats, and other vermin, which must either be vigilantly guarded against, or destroyed.

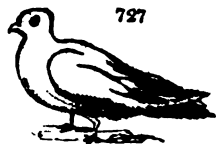
SECT. V. Of Birds of Luxury, which are, or may be, cultivated by Farmers.

6763. *Birds of luxury* include the pigeon, pheasant, partridge, quail, singing birds, and birds kept as curious objects.

6764. *Of the pigeon*, (*Columba*, L.) there are three species, and many varieties in cultivation. The species are, the common, ring, and turtle-doves, all natives of Britain. The varieties of the common pigeon, enumerated by Linnæus, amount to twenty-one; but those of the pigeon fanciers to more than double that number. The ring-dove (*C. palumbus*, L.), and the turtle-dove (*C. turtur*), with the greater number of the varieties, are cultivated only by a few persons known as pigeon fanciers; but the common pigeon of different colors is cultivated for the table. The flesh of the young pigeon is very savory and stimulating, and highly valued for pies; that of the full aged pigeon is more substantial, harder of digestion, and in a considerable degree heating. Black or dark feathered pigeons are dark fleshed, and of high flavor, inclining to the game bitter of the wild pigeon. Light colored feathers denote light and delicate flesh. The dung of pigeons is used for tanning upper leathers for shoes; it is also an excellent manure. Pigeons are now much less cultivated than formerly, being found injurious to corn fields, and especially to fields of peas. They are, however, very ornamental; a few may be kept by most farmers, and fed with the common poultry, and some who breed domestic fowls on a large scale, may, perhaps, find it worth while to add the pigeon to their number.

6765. *The variety of pigeon* most suitable for the common pigeon-house, is the grey pigeon (fig. 727.), inclining to ash-color and black; which generally shews fruitfulness by the redness of the eyes and feet, and by the ring of gold color which is about the neck.

6766. *The varieties of the fancy breeders* are numerous, and distinguished by a variety of different names, as carriers (fig. 728 a); croppers, powters, horsemen, runts, jacobines, turbits, helmets, nuns, tumblers (b); barbs, petits, owls, spots, trumpeters, shakers, turners, flinkins, &c. From these, when differently paired, are bred bastard pigeons; these



from the *cropper* or *powter*, and the carrier, is bred the *powting* *horsemen* (c); from the *tumbler* and the *horsemen*, *dragoons*, &c.



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6767. *The stocking of pigeon-houses* is best performed in May or August, as the birds are then in the best condition. Young birds called *squeakers* should be chosen, as the old are apt to fly away.

6768. In *breeding*, the pigeon lays two white eggs, which produce young ones of different sexes. When the eggs are laid, the female sits fifteen days, not including the three days she is employed in laying, and is relieved at intervals by the male. The turns are generally pretty regular. The female usually sits from about five in the evening till nine the next morning; at which time the male supplies her place, while she is seeking refreshment abroad. Thus they sit alternately till the young are hatched. If the female does not return at the expected time, the male seeks her, and drives her to the nest; and should he in his turn be neglectful, she retaliates with equal severity. When the young ones are hatched, they only require warmth for the first three days; a task which the female takes entirely upon herself, and never leaves them except for a few minutes to take a little food. After this they are fed about ten days, with what the old ones have picked up in the fields, and kept treasured in their crops, from whence they satisfy the craving appetite of their young ones, who receive it very greedily. This way of supplying the young with food from the crop, in birds of the pigeon-kind, differs from all others. The pigeon has the largest crop of any bird, for its size; which is also quite peculiar to the kind. In two that were dissected by an eminent anatomist, it was found that, upon blowing the air into the windpipe, it distended the crop or gullet to an enormous size. Pigeons live entirely upon grain and water; these being mixed together in the crop, are digested in proportion as the bird lays in its provision. Young pigeons are very ravenous, which necessitates the old ones to lay in a more plentiful supply than ordinary, and to give it a sort of half maceration in the crop, to make it fit for their tender stomachs. The numerous glands, assisted by air and the heat of the bird's body, are the necessary apparatus for secreting a sort of pap, or milky fluid (commonly called pigeon's milk), but as the food macerates, it also swells, and the crop is considerably dilated. If the crop were filled with solid substances, the bird could not contract it; but it is obvious the bird has the power to compress its crop at pleasure, and, by discharging the air, can drive the food out also, which is forced up the gullet with great ease. The young usually receives this tribute of affection from the crop three times a day. The male for the most part feeds the young female, and the old female performs the same service for the young male. While the young are weak, the old ones supply them with food macerated suitable to their tender frame; but, as they gain strength, the parents give it less preparation, and at last drive them out, when a craving appetite obliges them to shift for themselves; for when pigeons have plenty of food, they do not wait for the total dismission of their young; it being a common thing to see young ones fledged, and eggs hatching at the same time and in the same nest.

6769. *The terms applied to pigeons* of different ages are, the youngest, when fed by the cock and hen, *squabs*, at which age they are most in demand for pies. Under six months of age, they are termed *squeakers*; at that age they begin to breed, and then, or earlier, they are in the fittest state for removal to a strange situation.

6770. In respect to *food*, pigeons are entirely *granivorous*, and very delicate and cleanly in their diet; they will sometimes eat green aromatic vegetables, but are fondest of seeds; and tares, and the smallest kind of horse-beans, is the most suitable food both in point of economy and fattening qualities. Pease, wheat, buck-wheat, and even barley, oats, &c., are also eaten by pigeons, but old tares may be reckoned their very best food; new tares, pease, or beans, are reckoned scouring. Wherever pigeons are kept, the best way to keep them chiefly at home, and thereby both prevent their being lost, and their doing injury to corn-crops, is to feed them well: this is also the only way in which, in modern times, they will afford abundance of fat and delicate *squabs* for the table, which, well fed, they will do every month in the year, and thus afford a constant supply of delicate stimulating food. Pigeons are generally fed in the open air adjoining their cote or house; but in inclement weather, or to attach new pigeons to their home, both food and water should be given internally. That this may be done without waste, and without frequently disturbing the birds, two contrivances are in use; the first is the *meat-box* or *hopper*, from whence grain or pulse descends from the hopper as eaten out of a small shallow box; the next is the *water-bottle*, an ovate, long, naked bottle, reversed in a small basin to which it serves as a reservoir. Any bottle will do, but the pigeons are apt to alight on and dirty such as when reversed present a flat top.

6771. *Pigeons being fond of salt*, what is called a *pigeon-cat* is placed in the midst of the pigeon-house, or in the open air near it. It seems these birds are fond of salt and hot substances, and constantly swallow small stones to promote digestion. The *salt-cat* is thus composed; gravel or drift-sand, unctuous loam, the rubbish of an old wall, or lime, a gallon of each; should lime be substituted for rubbish, a less quantity of the former will suffice; one pound of cummin-seed, one handful of bay-salt; mix with stale urine. Inclose this in jars, corked or stopped, holes being punched in the sides, to admit the beaks of the pigeons. These may be placed abroad. They are very fond of this

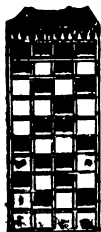
mixture, and it prevents them from pecking the mortar from the roofs of their houses, which they are otherwise very apt to do.

6772. *Cleanliness* is one of the first and most important considerations: the want of it in a dove-cote will soon render the place a nuisance not to be approached, and the birds, both young and old, will be so covered with vermin, and besmeared with their own excrement, that they can enjoy no health or comfort, and mortality is often so induced. Mowbray's were cleaned daily, thoroughly once a week, a tub standing at hand for the reception of the dung, the floor covered with sifted gravel, often renewed.

6773. *Pigeon-houses* are of three kinds, small boarded cases fixed on posts, trees, or against the ends of houses: lofts fitted up with holes or nests; and detached buildings. The first are generally too small to contain a sufficient brood, and are also too subject to variations of temperature; and the last, on the other hand, are now-a-days too large, and therefore the most suitable for the farmer is a loft or tower rising from a building in which no noisy operation is carried on. The lofts of any of the farm-buildings at a distance from the threshing-machine are suitable, or a loft or tower over any detached building will answer well; but the best situation of all is a tower raised from the range of poultry-buildings, where there is such a range, as the pigeons can thus be more conveniently treated, and will feed very readily with domestic poultry. For a tower of this sort, the round form should be preferred to the square; because the rats cannot so easily come at them in the former as in the latter. It is also much more commodious; as, by means of a ladder turning round upon an axis, it is possible to visit all the nests in the house, without the least difficulty; which cannot be so easily done in a house of the square form. And in order to hinder rats from climbing up the outside of it, the wall should be covered with tin-plates to a certain height, as about a foot and a half; which should project out three or four inches at the top, to prevent their getting up more effectually. A common mode in France is to raise a boarded room on a strong post powerfully braced (*fig. 729.*), the interior sides of which are lined with boxes for the birds (*a*), and the exterior east and west sides with balconies, or sills for them to alight on and enter to their boxes (*b*). The north and south sides are lined with boxes inside, but without openings, as being too cold on the one front, and too warm on the other.

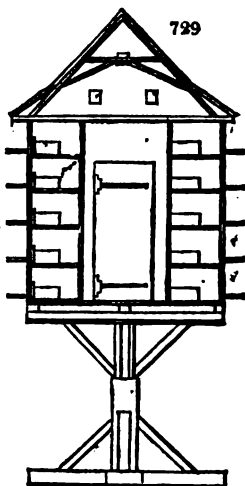
6774. *The interior of the pigeon-house* must be lined with nests or holes, subdivided either by stone, as in the ancient mural pigeon-houses; by boards; or each nest composed of a vase or vessel of earthenware fixed on its side. Horizontal shelves (*fig. 730.*), divided vertically at three feet distance, are generally esteemed preferable to

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every other mode; the width of the shelf may be twenty inches, the height between shelf and shelf eighteen inches; and a slip of board three or four inches high is carried along the front of the partitions to keep in the nests. Sometimes, also, a partition of similar height is fixed in the middle of each three-foot division, which thus divides it into two nests. This, Mowbray and Girton concur in recommending as likely to prevent the young from running to the hen when sitting over fresh eggs, and perhaps occasioning her to cool and addle them; for when the young

are about a fortnight or three weeks old, a good hen will leave them to the care of the cock, and lay again. Some prefer breeding-holes with no board in front, for the greater convenience of cleaning the nests; but as the squabs are apt to fall out by this practice, a good way would be to contrive the board in front to slip up and down in a groove, by which each nest might be cleaned at pleasure. As tame pigeons seldom take the trouble of making a nest, it is better to give them one of hay, to prevent the eggs from rolling. There are also straw buckets made in the form of nests, and also nests or pans of earthenware. Where pans are used, it is common to place a brick between them (two being placed in a breeding hole), for the cock and hen to alight on, but on the whole straw nests are best. The pigeon-house has two entrances, one a common sized door for man, either on the ground level, or to be ascended to by a ladder, as used formerly to be the case; and the other on a rising above the roof, and consisting of small holes three or four by twelve or fourteen inches for the entrance of the pigeons. A series of ranges of these are generally placed over each other, in a boarded front looking to the south, with a shelf to each range, and surrounded by a row of iron spikes to pro-



tect them from cats. The elevation of pigeon-houses (fig. 731.), as already described, are of endless variety.

6775. *The breeding holes* constitute the fixtures of the pigeon-house; its *utensils* are the hopper and bottle already described, (6770.) a barrel or box for food, a step-ladder to reach the nests, and some other articles not peculiar to this department of rural economy. The pigeon-trap for enticing and entrapping the pigeons of others, we do not describe.

6776. *Pigeons in new lodgings* are apt sometimes to forsake their *habitations*. Many nostrums have been recommended to prevent them from doing so; but if squabs be selected, cleanliness and security attended to, and a salt cot placed in or near the house, there will be little danger of this taking place. Fumigations with highly odoriferous drugs or even assafetida is also said to attract pigeons to a neglected dovecote, or attach them to a new one.

6777. *Diseases of pigeons*. Fancy pigeons, being many of them monstrous productions, are very subject to diseases. Girton enumerates upwards of a dozen with their cures, including the corruption of the egg in the uterus from over high feeding; a gorged crop from voracious feeding; insects from filthiness in the pigeon house, and the canker from cocks fighting with each other. Little can be done in the way of curing any of these diseases otherwise than by recurrence to the proper regimen; if this does not speedily take effect it is better to put the bird *hors de peine* both for humanity's sake and to prevent infection. Fortunately, the common pigeon reared for the table is little liable to diseases.

6778. *Laws respecting pigeons*. By the 1st of James, c. xxvii., shooting, or destroying pigeons by other means, on the evidence of two witnesses, is punishable by a fine of 20s. for every bird killed or taken, and by the 2d of Geo. III. c. xxix. the same offence may be proved by one witness, and the fine is 20s. to the prosecutor. Any lord of the manor or freeholder, may build a pigeon house upon his own land, but a tenant cannot do it without the lord's licence. Shooting or killing within a certain distance of the pigeon house, renders the person liable to pay a forfeiture.

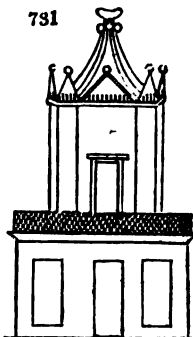
6779. *The common pheasant* (*Phasianus colchicus*, L.), is a native of the old continent, but not of America, and has long been naturalised in the warmer and most woody counties of England. It is very common in France, and before the Revolution used to be a great nuisance to the farmers, even to the gates of Paris. The pheasant runs fast, but flies low and heavily; it crows not unlike the common cock, being of the same genus, and is supposed to live six or eight years. Pheasants are both granivorous and carnivorous; they feed upon all sorts of insects and vermin like the peacock, and are said to be greedy of toads, when not too large to swallow; whereas, according to report, they will not touch the frog, of which ducks are so fond. They are prized in park scenery for their beautiful plumage and showy figure, and as game for the delicacy of their flesh, which is of a high flavor and alkaliescent quality. It is in season in autumn, and most esteemed when under a year old, and very fat. Every gentleman who has a well-wooded, well enclosed park, and in whose woods are abundance of such evergreens as the spruce fir, holly, box, broom, &c., may stock it with pheasants; and he may preserve his stock if he will continue to supply them with abundance of food, and deter thieves, polecats, &c. The more common the pheasant becomes, the less will it be subjected to the attacks of those enemies.

6780. *Varieties*. Besides that which may be considered common or wild in this country, and which is generally of a brown color, there is the *gold* and *silver*, natives of China, and very hardy in this country, and good breeders. The ring-necks, natives of Tartary, bred in China, very scarce; their plumage very beautiful. The white and pied; both sorts will intermix readily with our common breed, as will the Bohemia, one of the most beautiful of its kind, and equally scarce. The golden variety is generally of the highest price, and the common most hardy, and of the largest size.

6781. *Breeding*. In a wild state the hen-pheasant lays from eighteen to twenty eggs in a season, but seldom more than ten in a state of confinement. As this bird has not hitherto been domesticated, and as the flesh of those brought up in the house is much inferior to that of the wild pheasant, they are chiefly bred for show, for replenishing a park, or for turning out in well enclosed reclusive scenes, which they will not readily leave if well fed, and not much disturbed. Hence every proprietor may naturalize them at least on a part of his grounds, say, for example, a wood with glades of pasture enclosed by a close paling or high wall. The natural nest of the pheasant is made on the ground, and composed of dry grass and leaves, which being provided for her in confinement, she will always arrange properly. They will breed freely with the common fowl, but as neither flesh nor form are improved by the cross, this is seldom resorted to.

6782. *In stocking a pheasantry*, the general mode is to procure eggs from some establishment of this sort or otherwise, and the following are the directions of Castang, as given in *Mowbray's Treatise on Poultry*. Eggs being provided, put them under a hen that has kept the nest three or four days; and if you

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set two or three hens on the same day, you will have the advantage of shifting the good eggs. At the end of ten or twelve days, throw away those that are bad, and set the same hen or hens again, if setting hens should not be plenty. The hens having set their full time, such of the young pheasants as are already hatched, put into a basket, with a piece of flannel, till the hen has done hatching. The brood now come, put under a frame with a net over it, and a place for the hen, that she cannot get to the young pheasants, but that they may go to her: and feed them with boiled egg cut small, boiled milk and bread, alum curd, ants' eggs, a little of each sort, and often. After two or three days they will be acquainted with the call of the hen that hatched them, may have their liberty to run on the grass plat, or elsewhere, observing to shift them with the sun, and out of the cold winds; they need not have their liberty in the morning till the sun is up; and they must be shut in with the hen in good time in the evening. Every thing now going on properly, you must be very careful (in order to guard against the distemper to which they are liable) in your choice of a situation for breeding the birds up; and be less afraid of foxes, dogs, polecats, and all sorts of vermin, than the distemper. Castang had rather encounter all the former than the latter; for those with care may be prevented, but the distemper once got in is like the plague, and destroys all your hopes. What he means by a good situation is nothing more than a place where no poultry, pheasants, or turkeys, &c. have ever been kept; such as the warm side of a field, orchard, pleasure-ground, or garden, or even on a common, or a good green lane, under circumstances of this kind; or by a wood side; but then it is proper for a man to keep with them, under a temporary hovel, and to have two or three dogs chained at a proper distance, with a lamp or two at night. He has known a great number of pheasants bred up in this manner in the most exposed situations. It is proper for the man always to have a gun, that he may keep off the hawks, owls, jays, magpies, &c. The dogs and lamps shy the foxes more than any thing; and the dogs will give tongue for the man to be on his guard if smaller vermin are near, or when strollers make their appearance. The birds going on as before mentioned, should so continue till September, or (if very early bred), the middle of August. Before they begin to shift the long feathers in the tail, they are to be shut up in the basket with the hen regularly every night; and when they begin to shift their tail the birds are large, and begin to lie out, that is, they are not willing to come to be shut up in the basket: those that are intended to be turned out wild, should be taught to perch (a situation they have never been used to); this is done by tying a string to the hen's leg, and obliging her to sit in a tree all night: be sure you put her in the tree before sun-set; and if she falls down, you must persevere in putting her up again till she is contented with her situation; then the young birds will follow the hen, and perch with her. This being done, and the country now covered with corn, fruits, and shrubs, &c. they will shift for themselves. For such young pheasants as you make choice of for your breeding stock at home, and likewise to turn out in spring following, provide a new piece of ground, large and roomy for two pens, where no pheasants, &c. have been kept, and there put your young birds in as they begin to shift their tails. Such of them as you intend to turn out at a future time, or in another place, put into one pen netted over, and leave their wings as they are; and those you wish to keep for breeding put into the other pen, cutting one wing of each bird. The gold and silver pheasants you must pen earlier, or they will be off. Cut the wing often; and when first penned feed all your young birds with barley-meal, dough, corn, and plenty of green turnips.

6783. *A receipt to make alum curd.* Take new milk, as much as your young birds require, and boil it with a lump of alum, so as not to make the curd hard and tough, but custard like. Give a little of this curd twice a day; and ants' eggs after every time they have had a sufficient quantity of the other food. If they do not eat heartily, give them some ants' eggs to create an appetite, but by no means in such abundance as to be considered their food. The distemper alluded to above, is not improbably of the same nature as the roup in chickens, contagious, and dependent on the state of the weather; and for prevention requiring similar precautions. When a pheasantry is connected with a piece of ground covered with bushes or shrubbery, the birds may be bred in houses or pens, and afterwards put out into small enclosures, say one hundred feet square, with fences twelve feet high, each containing abundance of low evergreens, especially the spruce fir, and an artificial or natural supply of water. Under such an arrangement the hen pheasant will hatch her own eggs, and the following directions are given as to attendance by the same experienced person. Not more than four hens to be allowed in the pens to one cock. And in the out covers, three hens to one cock may be sufficient, with the view of allowing for accidents, such as the loss of a cock or hen. Never put more eggs under a hen than she can well and closely cover, the eggs fresh and carefully preserved. Short broods to be joined and shifted to one hen: common hen pheasants in close pens, and with plenty of cover, will sometimes make their nests and hatch their own eggs; but they seldom succeed in rearing their brood, being so naturally shy; whence should this method be desired, they must be left entirely to themselves, as they feel alarm even in being looked at. Eggs for setting are generally ready in April. Period of incubation the same in the pheasant as in the common hen. Pheasants, like the pea-fowl, will clear grounds of insects and reptiles, but will spoil all wall-trees within their reach, by picking off every bud and leaf.

6784. *Feeding.* Strict cleanliness to be observed, the meat not to be tainted with dung, and the water to be pure and often renewed. Ants' eggs being scarce, hog-lice, ear-wigs, or any insect may be given; or artificial ants' eggs substituted, composed of flour beaten up with an egg and shell together, the pellets rubbed between the fingers to the proper size. After the first three weeks, in a scarcity of ants' eggs, Castang gives a few gentles, procured from a good liver tied up, the gentles, when ready, dropping into a pan or box of bran; to be given sparingly, and not considered as common food. Food for grown pheasants, barley or wheat; generally the same as for other poultry. In a cold spring hemp seed, or other warming seeds are comfortable, and will forward the breeding stock.

6785. *In keeping fancy pheasants,* as the gold, silver, or other breeds, the best mode is to enclose a few poles of ground containing trees and bushes with a well painted copper netting, and in some concealed part to have a house or lodge for supplying water and food. This forms by far the most elegant aviary, and is the only one that at all times appears clean. They will thrive very well, however, in an aviary on the common construction.

6786. *The partridge (Tetrao perdix, fig. 732.)* is a native of all the temperate regions of Europe, but unable to sustain rigorous cold, or intense heat. Partridges are highly valued as food on most parts of the continent, and as a table luxury in England. In the Ukraine both partridges and pheasants are more abundant than any where else in Europe: they were formerly so common in France, that Rozier informs us it was necessary to sow three or four times the corn that was necessary to raise a crop, and that even this had often to be done three or four times in a season. The

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bird feeds like the pheasant on insects and seeds, and is particularly fond of those of the wild mustard. It has not been domesticated, but may be hatched and reared in the same manner as the pheasant.

6787. *The quail* (*Tetrao coturnix*, fig. 733.) is a native of the East, and abounds in Egypt, as appears from the supplies the Israelites obtained while in the wilderness, and also in the islands of the Archipelago, and in Italy. They migrate from warmer to colder regions. They are naturalized and breed in England, changing their residence within it on the approach of winter from the more exposed to the more temperate districts. They are very abundant in France, and are caught in snares and nets (described by Roxier), and sent both to the Paris and London markets. The bird was proverbial among the Romans



as captious and quarrelsome, and is employed among the Chinese for the same amusement as game cocks are in England. Here it is not domesticated, but may be reared and preserved in the same manner as the pheasant and partridge, and its food is nearly the same as that of the latter bird.

6788. *The red grouse*, or moor cock, (*Tetrao scoticus*, fig. 734.) is an esteemed variety of gallinacea, pursued with avidity by sportsmen in the mountainous districts of England, Wales, and Scotland, in which latter it abounds, there feeding in plenty among the heather, its favorite food. Its beautiful plumage, and its exquisite flavor, render it an object of considerable interest.



6789. *The black grouse*, or black cock, (*Tetrao tetrix*, fig. 735.) is less common than the red grouse, and is therefore more highly prized. It is also larger, weighing nearly four pounds. Its plumage is a rich mixture of black with blue; relieved by marking of white. Its legs are also covered with very fine minute feathers; and it draws a peculiar characteristic from the curvilinear form of the tail, which branches out at the end into two crooked expansions.

6790. *The wood grouse*, or cock of the wood, (*Tetrao urogallus*, fig. 736.) is, after the bustard, the largest bird

among those we call game; it being little less than a turkey. It was originally common in the mountainous parts of Britain; but is now nearly if not wholly extinct with us; though still common in the northern parts of Europe, where it lives in pine forests, on the cones of which it is supposed to subsist; and which at some seasons gives its flesh a terebinthinated taste: at other times it is delicious eating, and is often sent to England frozen. Like the other grouse he has the scarlet patch on his head, his legs are defended in the same manner by a feathered covering, and his whole markings are equally varied and beautiful. From the richness of the plumage in all the varieties of the tetrao, and from the extreme delicacy of their flesh as an article of food, it is to be lamented that attempts are not made to domesticate them in addition to our other poultry. It is thought by observant sportsmen, and scientific naturalists, that this might be attended with less difficulty than the domesticating the partridge and pheasant: and the attempt is recommended to the patriotic amateur.

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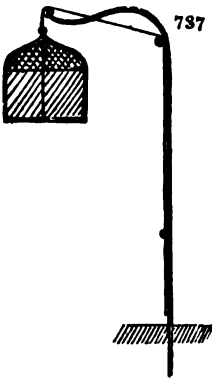
6791. *The lark* (*Alauda arvensis*, L.) and other birds were reared and fattened by the Romans for the table. The lark is caught by nets and other means in some of the open districts of England, as about Dunstable, Cambridge, &c., and brought to market for the table, as are various other birds by a particular class of men known as bird-catchers. It is an idle uncertain kind of life not to be recommended.

6792. *Of singing birds*, a great variety are domesticated; and their breeding and rearing forms a very peculiar and curious branch of rural economy. Not only all the birds which please by their natural song are domesticated and kept in cages; as the canary, nightingale, lark, linnet, finch, thrush, &c., but even some which do not sing in a wild state, as the sparrow, hammer, &c., are by art taught the notes of other birds.

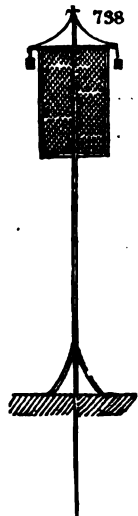
6793. *Wild singing birds* are caught by various devices, according to the species of bird, and season of the year. The pairing season in spring, generally March and April, is on the whole the best season, and the common means are a net called a clap trap, a

bird of the species to be caught, called a call-bird, to attract the wild one, and another, a female, called a brace-bird. Bird lime is also very generally used; and for nightingales, a small hole dug in the ground covered with a perforated board, or a small round spring trap, called a nightingale trap, is resorted to. Glasses called larkers are used to call larks, and hawks are used to frighten some species, to render them more readily taken. As it is only the male birds which sing, or at least are of any value for their song, it is a very material part of the bird fancier's art to know the male from the female when they are both young; in general he is larger and longer.

6794. In breeding and rearing tame birds, the chief art consists in teaching them to sing. This is frequently done by the human voice alone, but more commonly by the aid of the flageolet, or a small barrel organ. The organ is used in Germany in teaching the nightingale notes to the canary, and in teaching regular tunes, as marches, waltzes, &c. to the bulfinch, which after being so taught are called piping bulfinches, and cost from 5*l.* to 7 or 8 guineas each in London. In Italy the canary is taught various notes and tunes by the flageolet. In France, and also in this country, one bird is taught by another being placed in a cage near it. When not taught at all, and not within the hearing of other birds, each bird utters its natural notes, but very imperfectly. In general they are more ready to imitate the note of any bird they hear, even of a hen or duck, than to utter those which are natural to the species. This certainly appears singular, but it is a well known fact.



6795. The aviary, or place for breeding and keeping singing birds, may be a long narrow apartment fronting the south; the front to be covered with wire netting, and within this glass sashes which may be removed in summer. There should also be a flue in the floor or back wall to supply heat in cold weather. In such a building various birds may be kept in cages or a few sorts in compartments. Thus a considerable space may be allotted to the breeding of the canary, for which there is the greatest demand; the next largest to the linnet and nightingale; and any others may be kept in cages. Indeed singing birds are invariably found to sing best when kept in separate cages and apart from each other. In gardens or pleasure grounds these cages may be suspended from trees, or supported by light iron props.



(figs. 737-738.) and those who would wish to pursue this branch either as one of amusement or profit will find ample instructions in Thomson's *Bird Fancier*, Donovan's *British Birds*, and other works on ornithology.

6796. Curious showy or remarkable birds, as the parrot family, ostrich, crane, &c. are easily kept by supplying them with such food and climate as their natural history dictates.

6797. The training of hawks and other birds for hunting, (fig. 739.), of decoy birds of different sorts, as ducks, singing birds, pigeons, &c. belongs more to sportmanship than

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agriculture, and may be learned in Daniel's *Rural Sports*, and in various old books, such as *The Country Gentleman's Recreation*, &c.

CHAP. X.

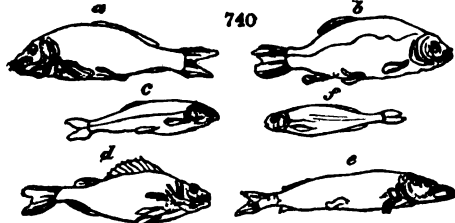
Of Fish and Amphibious Animals subjected to Cultivation.

6798. The *cultivation of fish* is carried on to a very limited extent in Britain, owing to the great superiority of the sorts obtained by fishing in rivers or the sea, and to the decline of the catholic religion, which no longer renders fish an article of importance on certain days and seasons. However, in a few places fish are bred and reared for the market, and in gentlemen's grounds in the interior of the country some attention is generally paid to stocking the ornamental pieces of water with appropriate fish. Bakewell, in his instructive *Travels in the Tarentaise*, suggests the idea of introducing exotic fish and naturalizing them in our lakes and rivers, and he mentions some Swiss species that he thinks would be particularly valuable. In the *Edinburgh Review* for 1822, is a curious paper on the possibility of rearing sea-fish in our fresh water lakes.

6799. The *mode of constructing ponds* for retaining water for general purposes has been already described. (4127.) Ponds expressly for the purpose of breeding and rearing fish, are formed at least expense in deep vallies, and slight depressions between hills, where there are rivers or waters. And different ones may often be made on the same line, the head of one constituting the bottom of that above it. The extent of them must be regulated by the nature of the situation, and the supplies of water that can be procured. In situations of this nature, the principal expense consists in constructing the banks or heads across the vallies, for keeping up the waters, and providing them with suitable sluices, which, where the land is of the loamy or clay kind, may be cheaply effected in the manner that earth works are usually performed. The foundations being laid sufficiently deep, and the earthy materials well applied by proper puddling and ramming, in the way of making embankments. The heights and strength of the dams or heads being regulated by the nature of the situations, and the quantity of water that is to be dammed up. The slopes should be the greatest which are next the waters. There must also be diverting channels for taking off the superabundant waters in the time of floods, which may be formed along the sides; the sluices being placed in the lowest parts, and being well made of seasoned oak, and tightly rammed in with the earthy materials.

6800. The *kinds of fish adapted for ponds* are chiefly the carp, tench, perch, gudgeon, eel, and pike.

6801. The *carp*, (*Cyprinus carpio*, L. fig. 740 a) is by far the best fish for artificial management, and especially that variety known in England as the Prussian carp. Carp inhabits the slow and stagnant waters of Europe and Persia, and was introduced into Britain in the year 1514; about four feet long; grows fast and is very long-lived; feeds on herbs, fat earth worms, and aquatic insects, and any soft substance; is extremely fertile, and the prey of larger fish, aquatic birds, and frogs; body above blue-green, the upper part of the sides greenish-yellow and blackish, beneath whitish; tail yellow; scales large, longitudinally striate; of the gill is made a green paint, and of the sounds or air-bladder a fish-glue.



6802. In *raising carp*, it is often the practice to have three ponds: one for the purpose of spawning the fish in, and in which they should be left during the rest of the summer and the following winter, as they mostly spawn from the beginning of May to the latter end of July; another for the convenience of nursing up the young fry, into which they should be put about the latter end of March or the beginning of April, choosing a calm but not sunny day for the business; after which they should be carefully prevented from coming to the sides and being destroyed: in this pond they may remain two years, and become four, five, or six inches in length, and good for use. The third or main pond is destined for the reception of the grown fish, as those that measure a foot or more, including the heads and tails. The proportions in which these different ponds are advised to be stocked are these:— for each acre of the first sort, "three or four male carps, and six or eight female ones." The most suitable sort for this use being "those of five six, or seven years old, in good health, with full scale, fine full eyes, and a long body, without any blemish or wound." The ponds should be previously cleared of all sorts of voracious fishes and other animals, as "perch, pike, eel, and trout; the water-beetle, and also the newts or lizards." Such ponds as are warm and have an open exposure, with soft water, are the most proper for this use, all kinds of water fowl being kept from them. For the nursing ponds a thousand or twelve hundred may not be more than sufficient for an acre, and for the main ponds, one to every square of fifteen feet is the proportion advised, as their growth depends greatly on the room and quantity of food that is allowed. The best seasons for performing the business in this case are those of the spring and autumn. Some advise, in these cases, the stocking with carp or tench in the proportion of three to a square perch. In first stocking large ponds or waters, as where they are to the extent of three or four acres, carp, in the proportion of three hundred to the acre, are recommended; and where they do not extend to such sizes, not so great a portion. And in stocking, after two or three years, four hundred to the acre.

6803. The *tench* (*Cyprinus tinca*, L., *b*) inhabits almost every where in stagnant waters ; grows quickly, and reaches from four to eight pounds weight ; is very fertile and tenacious of life, and will live all the winter under the ice ; feeds on worms and water plants ; is very foolish, and may be easily caught ; body covered with a thick mucus, and small scales which adhere firmly to the skin, above dark-green, the sides above the line green, beneath yellow, belly white ; varies in its colors by age, sex, or the waters it inhabits ; flesh white, soft, and well tasted.

6804. In stocking with *tench* the number per acre may be more than of carp. In Berkshire, where there are many ponds for the preserving of fish, they usually stock with *tench* or carp in the proportion of one hundred to the acre, the fish remaining four years in them. But in the management of Sir Harry Featherstone, in Sussex, in a pond of twenty acres reduced to sixteen by the deposition of mud, the stock is generally in the proportion of twelve hundred carp and an equal number of *tench* ; or at the rate of seventy-five brace to the acre. And in this proportion they are said to succeed well.

6805. The *gudgeon* (*Cyprinus gobicus*, L., *c*) is a very inferior fish to the carp or *tench*, but being of easy culture and rapid increase, is kept in many places as food for pike and perch. It inhabits gentle streams and lakes of Northern Europe ; is tenacious of life, and very fertile ; about eight inches long ; feeds on herbs, worms, insects, the fry of other fish, and parts of carcasses ; body narrow, spotted, above livid, the sides above the line blue, beneath whitish yellow, but it varies its colors by age, the different waters it inhabits, and its food ; flesh white, and very grateful.

6806. The *perch* (*Perca fluviatilis*, L., *d*) is an excellent fish, and though naturally found in streams in Europe and Siberia, yet will live in large ponds or lakes, provided the water be clear. It grows to two feet long ; back and part of the sides deep green, with five broad black bars, which are sometimes dark-green or blue, and very rarely wanting ; belly white, tinged with red ; swims with great swiftness and at a certain height in the water ; is tenacious of life, but eagerly takes a bait ; feeds on aquatic insects and smaller fish ; spawns in May and June, and is very prolific ; it has no real air-bladder, and from its integuments may be obtained a kind of glue ; flesh very delicate.

6807. In stocking with *perch*, as they are great breeders, six hundred to the acre may be sufficient.

6808. The *pike* (*Esox lucius*, L., *e*) inhabits most lakes of Europe, Lapland, Northern Persia, and North America, and is found even in the Caspian Sea ; swims, and grows very rapidly, one to eight feet long ; is extremely voracious and long-lived ; feeds on almost any thing which comes in its way, even its own tribe ; spawns from February to April ; body above black, the sides cineraceous spotted with yellow, beneath white dotted with black ; rarely orange spotted with black or green ; scales small, oblong, hard. The pike is best reared in deep ponds by itself, in which some gudgeon may be put to breed for its food. It will thrive in waters, partaking of the chalybeate quality, in which few other fish would live.

6809. The *gold fish* (*Cyprinus auratus*, L., *f*) is an inhabitant of the rivers of China and Japan, and is naturalized almost every where on account of its elegance and vivacity ; the colors vary greatly, but are naturally and mostly of a most splendid golden hue ; scales large. It is bred in small ponds in gardens near London and Paris for sale, as an ornamental inhabitant of crystal vases, or garden basons of water.

6810. The *minnow* (*Cyprinus phoxinus*, L., *f*), the *dace* (*C. lentiscus*, L., *f*), and the *roach* (*C. rutilus*, L., *f*), are very small fish, which abound, the first in gravelly streams, and the others in still waters ; both are useful as affording food to other fish, and may therefore be put into fish ponds. They are also very good to eat.

6811. Of the *trout and salmon family*, there are several species, as the lake trout, gilt and red charr, which inhabit Alpine lakes in northern countries, and might probably be introduced with advantage in the lakes of Cumberland, Westmoreland, and the Highlands of Scotland. The red charr is caught in Keswick lake. The salmon and salmon-trout (*Salmo salar*, and *S. trutta*), require salt water and a river ; and the fresh water trout (*S. fario*), requires too rapid a stream for art to imitate ; they succeed, however, to a certain extent, in very slow running waters which are clear.

6812. The *eel* (*Muræna anguilla*, L., *f*) inhabits almost every where in fresh waters ; grows sometimes to the length of six feet, and weighs twenty pounds ; in its appearance and habits something resembles the serpent tribe ; during the night quits its element, and wanders along meadows in search of snails and worms ; beds itself deep in the mud in winter, and continues in a state of rest ; is very impatient of cold, and tenacious of life ; the flesh of such as frequent running water is very good ; is viviparous, and has 116 vertebræ. One advantage of the eel is, that it will thrive in muddy ponds of very small size, where no other fish would live.

6813. On the subject of cultivating fishes it may be observed, that the waters of some ponds are better adapted for raising some sorts of fish than others. Thus, those where the water is rich and white are more adapted for carp ; while such as have a thicker appearance, and where there is a greater deposition of muddy matter, are better suited to *tench*. Perch are capable of being raised in almost any sort of ponds. Eels succeed best where the ponds are not very large, but where fed by a spring, and there is a large portion of rich

sediment. Pike should never be kept in ponds with carp or tench, but in separate breeding-ponds, where the supplies of small fry are considerable and not wanted for stores. Carp, tench, and perch are the sorts principally cultivated with a view to profit, with a few eels occasionally. But perch and eels should not be admitted where the ponds are but thinly stocked, as they are great devourers of the young fish. Carp and tench answer best together where the extents of the ponds are pretty large, as, in other cases, the former, from being a much more powerful fish, beats and deprives the latter of his food. Carp seldom afford much profit in ponds of less extent than half an acre; but tench thrive well in those of almost every size, being often found good in ponds of only a few perches square. Carp, perch, and eels succeed well together; and also tench and eels. Carp more frequently injure themselves by breeding than tench, though it sometimes happens with the latter. It is not improbable, but that in small ponds it may be the best practice to keep the carp and tench separate. The produce or profit afforded by fish-ponds has not yet, perhaps, been sufficiently attended to in different situations to afford correct conclusions; nor is it well ascertained what is the annual increase in weight in fish of different kinds, in different periods of their growth, and under different circumstances of soil and water. Loveden (*Annals of Agriculture*) states, that in Berkshire a pond of three acres and a half, drawn after being stocked three years with stores of one year old, produced of carp, 195 lb. weight, of tench 230 ditto; together 425 lb., which sold for 20l. 10s. or nearly 2l. 6s. per acre per annum.

6814. *The taking of cultivated fish* is generally done with nets, and sometimes by emptying the pond of water. Whatever way is adopted, only those fit to be used are taken, and the rest returned to grow larger. No fish is taken, or fit to be used, for a month before and after the spawning season, which with most fresh water fish is in April, May, or June. The Marquis de Chabanes proposes to catch fish, both in fresh and salt water, by immersing a burning lamp in an air box with mirrors, and round which he has traps into which the animals are to be entangled, while approaching the light and the multiplied images of their own species. For this contrivance he has taken out a patent. Salmon are sometimes caught by torch light.

6815. *The castration of fish* has been successfully practised both in this and other countries, and both with the male and female. Castrated fish attain to a larger size, and are in season at any period of the year. The mode of performing the operation is described in Rees's *Cyclopædia*, art. *Fish, Castration of*; and in the *Philosophical Transactions*, vol. 48. part ii. p. 106.

6816. *Of the amphibæa* which are or may be cultivated for food or ornament, the principal are the frog and tortoise.

6817. *The esculent frog* (*Rana esculenta*, L., fig. 741 a), though generally despised in this country, is yet an excellent article to those who are accustomed to it; and there are few Englishmen who have eaten a fricassé of the thighs of this animal in France or Italy, but what would wish to do so again. The body of this frog is green, with three yellow lines, the middle ones extending from the mouth to the anus, with the angles of the mouth distended in a globular form; the male makes a continual croaking in an evening, especially before rain; when irritated will pursue and destroy a pike. It is rare in England, but very common on the continent, where it is in season for the table in June.

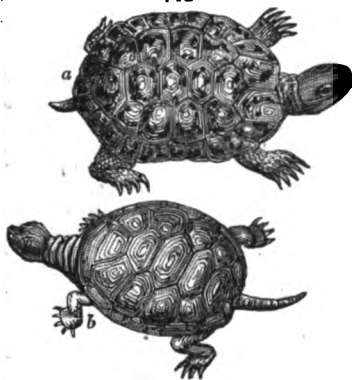


6818. *The tree frog* (*Rana arborea*, L., b), is green above, and whitish beneath, with a yellow curved line on the side. In elegance and activity it is superior to every other European species. In summer it resides in the woods, and haunts the trees in quest of insects, which it approaches on its belly, in the same manner as a cat to a mouse, and at length seizes with an elastic and instantaneous spring. It is particularly noisy on the approach of rain. In winter it takes up its abode in the bottom of the waters, remaining till the spring in a state of torpor. The noise of this frog is by many considered musical, and it is often kept in gardens in Germany both as a curiosity and as a weather guide. It certainly deserves introduction to this country.

6819. *There are two species of tortoise* which might be cultivated: the common, and the mud tortoise. The common tortoise (*Testudo græca*, L., fig. 742 a) weighs three pounds, and the length of its shell about seven inches. It abounds in the countries surrounding the Mediterranean, and particularly in Greece, where the inhabitants not only eat its flesh and eggs, but frequently swallow its warm blood. In Sep-

tember or October it conceals itself, remaining torpid till February, when it re-appears. In June it lays its eggs, in holes exposed to the full beams of the sun, by which they are

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matured. Tortoises attain most extraordinary longevity, and one was ascertained to have lived in the gardens of Lambeth to the age of nearly one hundred and twenty years. It will answer the purpose of a barometer, and uniformly indicates the fall of rain before night, when it takes its food with great rapidity, and walks with a sort of mincing and elate step. It appears to dislike rain with extreme aversion, and is discomfited and driven back only by a few and scarcely perceivable drops.

6820. *The mud tortoise* (*T. lutaria*, *b*), is common both in Europe and Asia, and particularly in France, where it is much used for food. It is seven inches long; lays its eggs on the ground, though an aquatic animal; walks quicker than the land tortoise; and is often kept in gardens, to clear them from snails and various wingless insects. In fish ponds it is very destructive, biting the fishes, and, when

they are exhausted by the loss of blood, dragging them to the bottom and devouring them. The tortoise may be fed on any vegetable refuse, milk, worms, offal, or almost any thing. Linnæus says they are in all things extremely slow, and in copulation frequently adhere together a month, and live several days after the head is cut off. (*Shaw's Zoology*.)

CHAP. XI.

Of Insects and Worms which are or may be subjected to Culture.

6821. *The insects* we mean to notice here are the silk moth, bee, and craw fish; and the worms, the leech and snail.

6822. *The silk worm or moth* (*Phalena mori*, L., fig. 56.) is a native of China, and was introduced into Europe in the reign of the Emperor Justinian, A.D. 160. It is a whitish moth, with a broad pale brown bar across each of the upper wings. The caterpillar or larva, emphatically known by the title of the silk worm, is, when full grown, nearly three inches long, and of a yellowish grey color: on the upper part of the last joint of the body is a horn-like process, as in many of the sphinges. It feeds, as every one knows, on the leaves of the white mulberry, in defect of which may be substituted the black mulberry, and even in some instances the lettuce, and a few other plants. The silk worm remains in its larva state about six weeks, changing its skin four times during that period, and, like other caterpillars, abstaining from food for some time before each change. When full grown, the animal entirely ceases to feed, and begins to form itself a loose envelopment of silken fibres in some convenient spot which it has chosen for that purpose, and afterwards proceeds to enwrap itself in a much closer covering, forming an oval yellow silken case or ball about the size of a pigeon's egg, in which it changes to a chrysalis, and after lying thus enclosed for the space of about fifteen days, gives birth to the moth. This, however, is always carefully prevented when the animals are reared for the purposes of commerce; the moth greatly injuring the silk of the ball, by discharging a quantity of colored fluid before it leaves the cell; the silk balls are, therefore, exposed to such a degree of heat as to kill the inclosed chrysalides, a few only being saved for the breed of the following year. The moth, when hatched is a very short-lived animal, breeding soon after its exclusion, and when the females have laid their eggs, they, as well as the males, survive but a very short time.

6823. *The culture of silk* varies but little in different countries; it does not require any great degree of skill, or a great capital; and it is well known that the silk worm with proper care, will breed and thrive very well in England. Though the price of labor is too high in this country to render this a profitable branch of rural economy, yet as it is carried on by some as matter of recreation, and may be useful in various ways, we shall describe the process.

6824. *The culture and treatment of the mulberry* is abundantly simple, and has been given in noticing the silk culture of France and Italy. It is a mistake of various

writers to assert that grafting is necessary; on the contrary, grafted mulberry trees are held in France to be later in exfoliating and shorter lived than seedlings. (*Cours d'Agr. &c.*, art. *Murier*.)

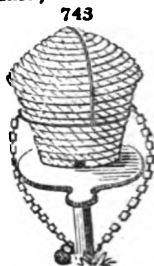
6825. *The produce of the worms or cocoons*, as soon as completed, are either reeled off, or, in the silk countries, sold to others, who make this a distinct trade. The silk, as formed by the worm, is so very fine, that if each ball, or cocoon, was reeled separately, it would be totally unfit for the purposes of the manufacturer; in the reeling, therefore, the ends of several cocoons are joined and reeled together out of warm water, which, softening their natural gum, makes them stick together, so as to form one strong smooth thread. As often as the thread of any single cocoon breaks, or comes to an end, its place is supplied by a new one, so that by continually keeping up the same number, the united thread may be wound to any length: the single threads of the newly added cocoons are not joined by any tie, but simply laid on the main thread, to which they adhere by their gum; and their ends are so fine as not to occasion the least perceptible unevenness in the place where they are laid on. The apparatus for reeling consists merely of a small open kettle of water, under which is a fire to keep it hot, and a reel of a very simple construction. Care should be taken in the operation, that the silk when reeled off may consist of a smooth thread of equal thickness and strength, not flat, but of a round form, having the small threads of which it is composed as equally stretched and firmly united as possible; and that the several rounds as they lie on the reel, should not be glued together. When the skain is quite dry it is taken off the reel, and a tie is made with some of the refuse silk on that part of the skain where it bore upon the bars of the reel, and another tie on the opposite part of the skain, after which it is doubled into a hank, and usually tied round near each extremity, when it is laid by for use or sale. In this state, in which all the silk that is brought from India, and considerable part of what comes from Italy and other parts, arrives, it is called raw silk; the principal part of it is afterwards sent to a mill to be thrown; that is, to have two ends of it doubled and twisted together, by which it is converted into tram, or organzine, according to the fineness of the silk, and the purposes to which it is intended to be applied in the manufacture.

6826. *The culture of silk in England* has been attempted at various periods from the time of James I., in 1608, to the present. A silk garden was established near St. James's Palace in 1629, and another at Chelsea in 1718. As the mulberry tree is scarce in some parts of this country, attempts have been made to feed the worms on other plants. Miss Croft, of York, in 1792, sent to the Society for the Encouragement of Arts, Manufactures, and Commerce, a specimen of silk produced by worms fed entirely upon lettuce leaves. This society continue to offer premiums for the production of silk in this country; and a company is now establishing, for giving it a complete trial, in several districts both of Britain and Ireland.

6827. *The common honey bee* (*Apis mellifica*, L.) inhabits Europe in hollow trees, but is chiefly kept in hives, being domesticated every where. Perhaps more has been written on the economy of this insect, than on any other animal employed in agriculture; and certainly to very little purpose. After all that has been done in England, France, and Italy, the bee is still more successfully cultivated, and finer honey produced, in Poland, by persons who never saw a book on the subject, or heard of the mode of depriving bees of their honey without taking their lives. Much as has been written in France and England on this last part of the subject, it is still found the best mode to destroy the hive in taking the honey. Unanswerable reasons for this practice, are given by La Grenée, a French apiarian, which are elsewhere quoted by us at length, (*Encyc. of Gard.* art. *Bees*), and allowed to be conclusive as to profit, even by Huish. The honey produced by any hive or apiary, depends much more on the season, and the quantity and kind of flowers with which the neighborhood abounds, than on the form of hive, or artificial management. Viewing the subject in this light we shall avoid noticing the mode of operating with glass, storying, cellular, or other curious hives of recent invention; and treat only of the simplest methods. The author we shall follow is Howison.

6828. *The apiary* or place where the bee-hives are placed should in very warm situations be made to face the east; and in colder districts the south-east. It should be well protected from high winds, which not only prevent the bees from leaving the hive in quest of honey, but they also surprise them in the fields, and often kill them by dashing them against the trees and rocks, or into rivers. The hives in an apiary should always be placed in a right line; but should the number of the hives be great, and the situation not capacious enough to admit of their being placed longitudinally, it is more advisable to place them over one another, on shelves, (*fig. 357.*) than in double rows on the ground. A bee, on leaving the hive, generally forms an angle of about forty-five with the horizon; the elevation of the hive should, therefore, be about two feet from the ground, in order to

protect it from humidity. The greater the elevation of the hive, the longer is the flight of the swarm; and when they are at a certain point of elevation, the swarms are lost for ever to the proprietor. If the hives are to be placed in a double row, the hinder ones should alternate with, and be placed at such a distance from the front ones, that when the bees take their flight, no obstruction is offered to their ascent. Huish recommends placing every hive upon a single pedestal, and at two or three feet distance from each other. By this means when any thing happens to one hive, the others are less likely to be disturbed than when placed on a shelf in a bee house; and the hive may be chained down and locked (fig. 743.) It is usual to have three or four legs or supports to the bee boards, but those who have tried one will never resort to more, as one is a much better protection from vermin and insects. The space in front of the apiary should be kept clear of high plants for two or three yards.

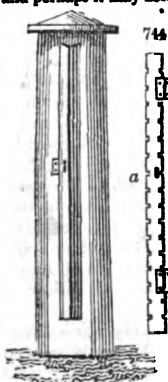


6829. The *variety of bees* employed is a matter of some consequence. To the common observer, all working bees, as to external appearance, are nearly the same; but to those who examine them with attention, the difference in size is very distinguishable; and they are, in their vicious and gentle, indolent and active natures, essentially different. Of the stock which Howison had in 1810, it required 250 to weigh an ounce; but they were so vicious and lazy, that he changed it for a smaller variety, which possesses much better dispositions, and of which it requires 296, on an average, to weigh an ounce. Whether size and disposition are invariably connected, he has not yet had sufficient experience to determine.

6830. The *best material and form* for hives is a straw thimble or flower-pot placed in an inverted position. Hives made of straw, as now in use, have a great advantage over those made of wood and other materials, from the effectual defence they afford against the extremes of heat in summer, and cold in winter.

6831. The *size of hives* should correspond as nearly as possible with that of the swarms. This has not had that attention paid to it which the subject demands, as much of the success in the management of the bees depends on that circumstance. From blind instinct, bees endeavor to fill with combs whatever hive they are put into, before they begin to gather honey. Owing to this, when the hive is too large for its inhabitants, the time for collecting their winter store is spent in unprofitable labor: and starvation is the consequence. This evil also extends to occasioning late swarming the next summer; it being long before the hive becomes so filled with young bees as to produce a necessity for emigration, from which cause the season is too far advanced for the young colonies to procure a winter stock. A full sized straw hive will hold three pecks, a small sized from one and a half to two pecks.

6832. The *Polish hive*, (*Pasieka Pol.*, fig. 744.) appears to us to be the second in merits to that described, and perhaps it may deserve the preference, if the mode of using it were generally known. It is simply the trunk of a tree, of a foot or fourteen inches in diameter, and about nine feet long. It is scooped out (boring in this country would be better) for about six feet from one end, so as to form a hollow cylinder of that length, and of six or eight inches diameter within. Part of the circumference of this cylinder is cut out during the greater part of its length, about four inches wide, and a slip of wood is made to fit the opening. On the sides of this slip or segment (a) notches are made every two or three inches, of sufficient size to allow a single bee to pass. This slip may be furnished with hinges and with a lock and key; but in Poland it is merely fastened in by a wedge. All that is wanting to complete the hive is a cover at top to throw off the rain, and then it requires only to be placed upright like a strong post in the garden, so as the bottom of the hollow cylinder may be not nearer the ground than two feet, and the opening slip look to the south. When a swarm is to be put in, the tree, with the door or slip opened, is placed obliquely over it; when the bees enter, the door is closed, and the holes stopped with clay till the hive is planted or placed upright. When honey is wanted, the door is opened during the finest part of a warm day, when most of the bees are out; its entire state is seen from top to bottom, and the operator, with a sear in his mouth, or with a lighted rag, to keep off the bees from his hands, cuts out with a crooked knife, as much comb as he thinks fit. In this way fresh honey is obtained during the summer, the bees are never cramped for room, nor does it become necessary to kill them. The old comb, however, is annually cut out to prevent or lessen the tendency to swarming, which, notwithstanding this and the size of their dwelling, they generally do once a year; for the laws of nature are not to be changed. Though it be a fact, that a small swarm of bees will not do well in a large hive, yet if the hive extend in length and not in breadth, it is admitted both by Huber and Huish, that they will thrive in it. "If too great a



diameter," says Huber, "be not given to the abode of the bee, it may without danger be increased in the elevation; their success in the hollow trees, their natural domicile, incontestably proves the truth of this assertion."

6833. The *feeding of bees* is generally deferred till winter or spring, but this is a most erroneous practice. Hives should be examined in the course of the month of September or about the time of killing the drones, and if a large hive does not weigh thirty pounds, it will be necessary to allow it half a pound of honey, or the same quantity of soft sugar, made into syrup, for every pound that is deficient of that weight; and, in

like proportion, to smaller hives. This work must not be delayed, that time may be given for the bees to make the deposit in their empty cells before they are rendered torpid by the cold. Sugar simply dissolved in water (which is a common practice), and sugar boiled with water into a syrup, form compounds very differently suited for the winter store of bees. When the former is wanted for their immediate nourishment, as in spring, it will answer equally as a syrup: but if to be laid up as store, the heat of the hive quickly evaporating the water, leaves the sugar in dry crystals, not to be acted upon by the trunks of the bees. Hives may be killed with hunger, while some pounds weight of sugar remain in this state in their cells. The boiling of sugar into syrup forms a closer combination with the water, by which it is prevented from flying off, and a consistence resembling that of honey, retained. Howison has had frequent experience of hives not containing a pound of honey, preserved in perfect health through the winter, with sugar so prepared, when given in proper time, and in sufficient quantity.

6834. *To protect hives from the cold*, they are covered with straw or rushes, about the end of September, or later, according to the climate and season. This is an essential business, as well covered hives always prosper better the following season than such as have not been covered. In October, the aperture at which the bees enter should generally be narrowed, so as only one bee may pass at a time. Indeed, as a very small portion of air is necessary for bees in their torpid state, it were better, during severe frosts, to be entirely shut up, as numbers of them are often lost from being enticed to quit the hive by the sunshine of a winter day. It will, however, be proper at times to remove, by a crooked wire, or similar instrument, the dead bees and other filth, which the living at this season are unable to perform of themselves. To hives, whose stock of honey was sufficient for their maintenance, or those to which a proper quantity of sugar had been given for that purpose, no further attention will be necessary until the breeding season arrives. This, in warm situations, generally takes place about the beginning of May, and in cold, about a month after. The young bees, for a short time previous to their leaving their cells, and some after, require being fed with the same regularity that young birds are by their parents; and if the store in the hive be exhausted, and the weather such as not to admit of the working bees going abroad to collect food in sufficient quantity for themselves and their brood, the powerful principle of affection for their young compels them to part with what is not enough for their support, at the expence of their own lives. To prevent such accidents, it is advisable, if, during the breeding season, it rain for two successive days, to feed all the bees indiscriminately, as it would be difficult to ascertain those only who require it.

6835. *The swarming of bees* generally commences in June, some seasons earlier, and in cold climates or seasons later. The first swarming is so long preceded by the appearance of drones, and hanging out of working bees, that if the time of their leaving the hive is not observed, it must be owing to want of care. The signs of the second are, however, more equivocal, the most certain being that of the queen, a day or two before swarming, at intervals of a few minutes, giving out a sound a good deal resembling that of a cricket. It frequently happens that the swarm will leave the old hive, and return again several times, which is always owing to the queen not having accompanied them, or from having dropt on the ground, being too young to fly to a distance. Gooseberry, currant, or other low bushes, should be planted at a short distance from the hives, for the bees to swarm upon, otherwise they are apt to fly away; by attending to this, Howison has not lost a swarm by straying for several years. When a hive yields more than two swarms, these should uniformly be joined to others that are weak, as from the lateness of the season, and deficiency in number, they will otherwise perish. This junction is easily formed, by inverting at night the hive in which they are, and placing over it the one you intend them to enter. They soon ascend, and apparently with no opposition from the former possessors. Should the weather, for some days after swarming, be unfavorable for the bees going out, they must be fed with care until it clears up, otherwise the young swarm will run a great risk of dying.

6836. *The honey may be taken from hives of the common construction, by three modes*, partial deprivation, total deprivation, and suffocation.

6837. *Partial deprivation* is performed about the beginning of September. Having ascertained the weight of the hive, and consequently the quantity of honey-comb which is to be extracted, begin the operation as soon as evening sets in, by inverting the full hive, and placing an empty one over it; particular care must be taken that the two hives are of the same diameter, for if they differ in their dimensions, it will not be possible to effect the driving of the bees. The hives being placed on each other, a sheet or large table-cloth must be tied round them at their point of junction, in order to prevent the bees from molesting the operator. The hives being thus arranged, beat the sides gently with a stick or the hand, but particular caution must be used to beat it on those parts to which the combs are attached, and which will be found parallel with the entrance of the hive. The ascent of the bees into the upper hive will be known by a loud humming noise, indicative of the pleasure in finding an asylum from their enemy; in a few minutes the whole community will have ascended, and the hive with the bees in it may be placed upon the pedestal from which the full hive was removed. The hive, from which the bees have been driven, must then be taken into the house, and the operation of cutting out the honey-comb commenced. Having extracted the requisite quantity of comb, this opportunity must be embraced of inspecting the

hive, and of cleaning it from any noxious matter. In cutting the combs, however, particular attention should be paid not to cut into two or three combs at once, but having commenced the cutting of one, to pursue it to the top of the hive; and this caution is necessary for two reasons. If you begin the cutting of two or three combs at one time, were you to extract the whole of them, you would perhaps take too much; and secondly, to stop in the middle of a comb, would be attended with very pernicious consequences, as the honey would drop from the cells which have been cut in two, and then the bees, on being returned to their native hive, might be drowned in their own sweets. The bees, also, in their return to their natural domicile, being still under the impression of fear, would not give so much attention to the honey which flows from the divided cells; and as it would fall on the board, and from that on the ground, the bees belonging to the other hives would immediately scent the wasted treasure, and a general attack on the deprived hive might be dreaded. The deprivation of the honey-comb being affected, the hive may be returned to its former position, and reversing the hive which contains the bees, and placing the deprived hive over it, they may be left in that situation till the morning, when the bees will be found to have taken possession of their native hive, and if the season proves fine, may replenish what they have lost. (*Huish's Treatise on Bees.*)

6838. *Total deprivation* is effected in the same manner, but earlier in the season, immediately after the first swarm; and the bees, instead of being returned to a remnant of honey in their old hive, remain in the new empty one; which they will sometimes, though rarely, fill with comb. By this mode, it is to be observed, very little honey is obtained, the bees in June and July being occupied chiefly in breeding, and one, if not two, swarms are lost.

6839. *Suffocation* is performed when the season of flowers begins to decline, and generally in October. The smoke of paper, or linen rag soaked or smeared with melted sulphur, is introduced to the hive by placing it in a hole in the ground, where a few shreds of these articles are undergoing a smothering combustion; or the full hive may be placed on an empty one, inverted as in partial deprivation, and the sulphureous smoke introduced by a fumigating bellows, &c. The bees will fall from the upper to the lower hive in a few minutes, when they may be removed and buried, to prevent resuscitation. Such a death seems one of the easiest, both to the insects themselves, and to human feelings. Indeed, the mere deprivation of life to animals, not endowed with sentiment or reflection, is reduced to the precise pain of the moment, without reference to the past or the future; and as each pulsation of this pain increases in effect on the one hand, so on the other, the susceptibility of feeling it diminishes. Civilised man is the only animal to whom death has terrors, and hence the origin of that false humanity, which condemns the killing of bees in order to obtain their honey; but which might, with as much justice, be applied to the destruction of almost any other animal used in domestic economy, as fowls, game, fish, cattle, &c.

6840. On the *produce and profit* of bees much has been said by the patriotic apirians. Both, however, are extremely uncertain; and as to the profit, it can never be great, while there is the competition of all Europe to contend with as to honey and wax, and no great demand for swarms. Bees, however, are interesting creatures, are supported at almost no expense; and a hive or two is therefore very desirable in the garden of every farmer and cottager.

6841. *The craw or cray fish* (*Cancer astacus*, L. fig. 745.), is a native of Britain, inhabiting still rivers and marshes, and lodging itself in holes made in the clayey banks.

The flesh is of an excellent flavor, and very nutritious, and has been recommended to persons under atrophies. There are various methods of preparing these animals: they may be either boiled or fried, and then taken out of their shells and made up in a variety of dishes. Preparations and broths of cray-fish have been celebrated not only for a palatable aliment, but also for answering some medicinal intentions, as being of a moistening quality, and correcting acrimony. The delicate flavor of these fish depends in a great measure on their food. When they have well-tasted food, their flesh preserves the relish of it; but when they feed on other things, they are often rendered of no value, by the flavor communicated to their flesh by them. It has been found that where the *Acorus calumnus* abounds, they feed on the roots of this plant, which renders their flesh so bitter as to be uneatable. They are very greedy of flesh, and flock in great numbers about carcases thrown into the water where they are, and never leave it while any remains. They also feed on dead frogs when they come in their way.

6842. *The culture* of this delicious fish, it is evident, might be successfully carried on in small ponds, or in canals in parks. In the former case supplying them with any animal or vegetable refuse. They wander far from their aquatic residence in quest of food, and that is the time when they are generally caught. A breeding stock may be obtained from any fisherman on the Thames or Trent, or by applying in Covent Garden, though they are by no means common in Britain. They are perhaps most common near Alnwick, in Northumberland.

6843. *The edible snail* (*Helix pomatia*, L. fig. 75 a), is a native of Italy; but being imported to this country about the middle of last century, is now considered as naturalized. Aubrey informs us, that they were introduced by Charles Howard, Esq. an epicure of the Arundel family, as an article of food, who scattered and dispersed those snails all over the downs and in the woods at Albury, an ancient seat of that noble family; and also near Ashted, Boxhill, Dorking, Epsom, and Surrey, where they have increased so greatly, that even the confines of Sussex abounds with them. His example was followed by others in different parts of the kingdom, but by none with so much success as by Sir Kenelm Digby, who dispersed them about Gothurst, the seat of that family near Newport-Pagnel, in Buckinghamshire.



6844. This is the largest species of land-snail in England. When full-grown, the shell is from an inch and a half to two inches in diameter in our climate; on the continent, towards the south, its size is much superior. The animal being large and fleshy, and not of an unpleasant flavor, has been esteemed as an article of food from early times. It was a favorite dish with the Romans, who had their cochlearia, or snail-stews, in which they were bred and fattened. Varro has handed down to us a description of these stews, and the manner of making them: he says, open places were chosen surrounded by water, that the snails might not abandon them, and care was taken that the places were not much exposed to the sun or to the dews. If a natural spring or moisture was not found, they formed an artificial one, by bringing a pipe to the stew bored full of holes, like a watering-pot, by which the place was continually sprinkled or moistened. The snails required little attention or food, for as they crawled they found it on the floor or area. They were fed with bran and sodden lees of wine, or similar substances intermixed with a few laurel-leaves. In the neighborhood of Vienna they are caught and preserved till wanted in large pits covered with boards; they are fed with cabbage-leaves, gralus, bran, meal, or any vegetable refuse. In Italy and Vienna they are commonly sold in the markets, and are called bavoli, martinacci, and galinelle. In France, says Lister, they boil them in river water, and season them with salt, pepper, and oil. This practice continues at the present period.

6845. The medicinal leech (*Hirudo medicinalis*, L.), grows to the length of two or three inches. The body is of a blackish-brown color, marked on the back with six yellow spots, and edged with a yellow line on each side; but both the spots and the lines grow faint, and almost disappear at some seasons. The head is smaller than the tail, which fixes itself very firmly on any thing the creature pleases. It is viviparous, and produces but one young at a time, which is in the month of July. It is an inhabitant of clear running waters, and is well known for its use in bleeding. If put into shallow clear ponds it will breed freely, and this is practised by some herbalists and apothecaries in the neighborhood of London. The chief supply, however, is from the lakes of Cumberland, where they are caught by women who go into the water bare-legged, and after a few have fastened, they walk out and pick them off. A good many are also brought from Holland.

CHAP. XII.

Of Animals noxious to Agriculture.

6846. Almost every animal may be injurious to the agriculturist in some way or other. All the cultivated live-stock will, if not excluded by fences, or prevented by herding, eat or tread down corn crops or other plants in culture. Those animals, as the dog and ferret, which assist him in deterring or in catching noxious animals which would prey on others, will themselves become depredators if not attended to; and even man, the only rational, and therefore the most valuable of agricultural servants, will prove, under certain circumstances, the greatest of all enemies to the agriculturist. We shall glance at the different animals more especially noxious in the order of their usual classification.

SECT. I. *Of noxious Mammalia.*

6847. Of noxious mammalia, man, in a demoralised state, is the most injurious. The remedy is furnished by the law—the preventive is good education, and civil treatment by the master.

6848. The fox (*Canis vulpes*) commits great ravages among lambs, poultry, geese, &c. To destroy it, the farmer must take a sheep's paunch and fasten it to a long stick; then rub his shoes well upon the paunch, that the fox may not scent his feet. He should then draw his paunch after him as a trail, a mile or upwards, till he gets near some large tree; then leave the paunch and ascend into the tree with a gun; and as the night comes on, he may see the fox come after the scent of the trail, when he may shoot him. The trail should be drawn to the windward of the tree, if he can conveniently contrive so to do.—Or, set a steel-trap in the plain part of a large field, distant from paths and hedges; then open the trap, place it on the ground, cut out the exact shape thereof in a turf, and take out just so much earth to make room for it to stand, and then cover it again very neatly with the turf you cut out. As the joint of the turf will not close exactly, procure some mould of a mole-hill newly thrown up, and stick some grass on it, as if it grew there. Scatter some mould of the mole-hill very thin three different ways, at the distance of ten or twelve yards from the trap; let this mould be thrown on spots fifteen or sixteen inches square; and where the trap is placed, lay three or four small pieces of cheese; and then, with a sheep's paunch, draw a trail a mile or two long to each of these three places, and from thence to the trap, that the fox may approach one of the places first; for then he will advance to the trap more boldly; and thus you will be almost always sure of catching him. You must take care that your trap be left loose, that he may draw it to some hedge or covert, or he will otherwise bite off his leg, and so make his escape.—Or near the spot where the fox uses much to resort, fix a stick or pole, much

in the same manner as for a woodcock. To explain this more exactly: tie a string to some pole set fast in the ground, and to this string fasten a small short stick, made thin on the upper side, with a notch at the lower end of it; then set another stick fast in the ground, with a nick under it; bend down the pole, and let the nicks or notches join in the slightest degree: then open the noose or string, and place it in the path or walk of the fox. By strewing flesh-meat, pieces of cheese, &c., as you pass along, you may entice the fox to take the same road.

6849. To shoot a fox, anoint the soles of the shoes with swine's fat, a little broiled; then go towards the wood, and, in returning, drop here and there a bit of swine's liver, roasted and dipped in honey, drawing after you a dead cat; and by these means he therefore will be allured to follow you.

6850. The fox is sometimes taken with a hook, made of large wire, and turning on a swivel like the collar of a greyhound; it is usually hung so high from the ground, that he is compelled to leap to catch at it; and baited with fresh liver, cheese, &c., and if a trail be run with a sheep's paunch, as before directed, he will be drawn to the bait with the greatest ease.

6851. The pole cat (*Felis putorius*, L.) may be caught and destroyed by a dead-fall, constructed in the following manner. Take a square piece of wood, weighing forty or fifty pounds: bore a hole in the middle of the upper side, and set a crooked hook fast in it; then set four forked stakes fast in the ground, and lay two sticks across, on which sticks lay a long staff, to hold the dead fall up to the crook; and under this crook put a short stick, and fasten a line to it: this line must reach down to the bridge below; and this bridge you must make about five or six inches broad. On both sides of this dead-fall, place boards or pales, or edge it with close rods, and make it ten or twelve inches high. Let the entrance be no wider than the breadth of the dead-fall.—A pigeon house, surrounded with a wet ditch, will tend to preserve the pigeons; for beasts of prey naturally avoid water.

6852. The weasel, or Fomart, (*Felis vulgaris*, L.), though in some respects beneficial, in as much as when domesticated, it destroys rats, mice, moles, and other noxious vermin, is nevertheless, in a wild state, a formidable foe to poultry and rabbits. Weasels may be destroyed by putting in their haunts small pieces of paste, consisting of pulverized sal. ammoniac, mixed up with the white of an egg, wheaten flour, and honey. The strewing of rue round the place where hens nestle, is also said to drive away these depredators; as also will the smell of a burnt cat; as all animals are terrified at the burning of one of their own, or of a similar species.

6853. The badger (*Ursus meles*, L.) destroys great numbers of young pigs, lambs, and poultry every year. Some use a steel trap, or a spring, such as foxes are taken in, to catch them. Others sink a pit-fall, five feet in depth and four in length, forming it narrow at top and bottom, and wider in the middle; they then cover it with small sticks and leaves, so that the badger may fall in when he comes on it. Foxes are sometimes taken in this manner. Others, again, pursue a badger to his hole, and dig him out, this is done by moonlight.

6854. The mole (*Talpa europæa*) is injurious by the subterraneous roads and hills of earth which it forms in grass lands. With regard to the removal of mole hills, various practices are in use; but the most effectual is that derived from the experience of a successful mole-catcher, and communicated to the public by Dr. Darwin, in his *Phytologia*. This man commenced his operations before sun-rising, when he carefully watched their situation; and frequently observing the motion of the earth above their walks, he struck a spade into the ground behind them, cut off their retreat, and then dug them up. As moles usually place their nests at a greater depth in the ground than their common habitation lies, and thus form an elevation or mole-hill, the next step is to destroy these nests by the spade; after which the frequented paths are to be distinguished from the bye-roads, for the purpose of setting subterraneous traps. This object may be effected by marking every new mole-hill with a slight pressure of the foot, and observing the next day whether a mole has passed over it, and destroyed such mark; and this operation should be repeated two or three mornings successively, but without making the pressure so deep as to alarm the animal, and occasion another passage to be opened. Now the traps are to be set in frequented paths, and should be made of a hollow, wooden semi-cylinder, (fig. 283.), each end of which should be furnished with grooved rings, containing two nooses of horse-hair, that are loosely fastened in the centre by means of a peg, and are stretched above the surface of the ground by a bent stick or strong hoop. As soon as the mole passes half-way through one of these nooses, and removes the central peg in its course, the hoop, or bent stick, rises in consequence of its elasticity, and of course strangles the mole. The simplicity of this mode of destroying mole-hills and moles, recommends itself to general adoption, as those whose grounds are thus infested may easily extirpate them, by teaching this practice to their laborers.

6855. The domestic rat (*Mus rattus*, L., fig. 746.) and common mouse, (*M. musculus*, L.) are extremely destructive to the farmer, whose interest it becomes to extirpate as many as possible. Among the various expedients suggested for this purpose, the following have been found the most successful.

6856. When a rat or mouse has been caught, cut or beat him severely, and let him go; and he will make such a crying noise, that his companions will desert the place. Some persons, indeed, flea off the skin of their heads; but this method of extermination is too cruel to be recommended to the practice of any humane person: or, put a piece of fried rusty bacon in the middle of a board, three feet square, and cover the board pretty thickly with bird-lime, leaving some narrow alleys for the vermin to get at the bacon, in doing which they will frequently get among the lime and be caught. In Staffordshire it is customary to put bird-lime about the holes, amongst which they run; and, the bird-lime adhering to them, they will not cease scratching until they kill themselves.—Or, mix the expressed juice of the deadly nightshade with wheaten flour or oat-meal; cut the paste into small pieces, and put them in the holes or tracks frequented by the rats: though they will not eat this nauseous dose, its smell is so exceedingly offensive that they will immediately decamp. Of course, the renewal of this preparation, as often as it loses its odor, will prove an effectual barrier to the return of these vermin. In order to prevent accidents to domestic animals from the poisons usually employed, it has been suggested to place the baits in the traps, and to enclose the traps in cases, having holes in the ends of them large enough to admit rats, but small enough to exclude cats, dogs, &c.



6857. The two following expedients for destroying rats are given in Willck's *Domestic Encyclopedia*, vol. iii. Among other remedies, he recommends that commonly employed on the continent, when a sponge is fried with salt butter in a pan; then compressed between two plates, and cut into small pieces, which are scattered about the holes frequented by rats and mice. This preparation is devoured with avidity; it excites thirst in the animals, which should be gratified by exposing shallow vessels containing water. On drinking this fluid, after having swallowed the burnt sponge, it distends their stomach, and proves a fatal repast.—Or, a capacious cask of moderate height must be procured, and put in the vicinity of places infested with rats. During the first week, this vessel is only employed to allure the rats to visit the solid top of the cask, by means of boards or planks arranged in a sloping direction to the floor, which are every day strewed with oatmeal, or any other food equally grateful to their palate; and the principal part of which is exposed on the surface. After having thus been lulled into security, and accustomed to find a regular supply for their meals, a skin of parchment is substituted for the wooden top of the cask, and the former is cut for several inches, with transverse incisions through the centre, so as to yield on the smallest pressure. At the same time, a few gallons of water, to the depth of five or six inches, are poured into the empty cask. In the middle of this element a brick or stone is placed, so as to project one or two inches above the fluid; and that one rat may find on the former a place of refuge. These preparatory measures being taken, the boards as well as the top of the cask should now be furnished with proper bait, in order to induce them to repeat their visits. No sooner does one of these marauders plunge through the section of the parchment into the vessel, than it retreats to the brick or stone, and commences its lamentations for relief. Nor are its whining notes uttered in vain; others soon follow, and share the same fate; when a dreadful conflict begins among them, to decide the possession of the dry asylum. Battles follow in rapid succession, attended with such loud and noisy shrieks, that all the rats in the neighborhood hasten to the fatal spot, where they experience similar disasters. Thus hundreds may be caught by a stratagem, which might be greatly facilitated by exposing a living rat taken in a trap, or purchased from a professional rat-catcher.

6858. A successful mode of enticing rats has been lately practised by Broad, a farmer at Thruxton in Herefordshire. He uses a bore trap, two feet long, eight inches wide, and nine inches deep, and little different in construction from the common one. His secret consists in scenting light colored malt, and also some wheat straws with oil of carraways, and not setting the traps for a day or two till the rats have been accustomed to eat the malt without fear. (*F. Mag.* xiv. p. 421.)

6859. The water or field rat (*Mus amphibius*, L.), and the field mouse (*M. terrestris*, fig. 747.), may be destroyed as follows. Go out in the dog-days, when the fields are tolerably bare; and having found their nests or holes, (which in shape and size resemble augur-holes) put therein hemlock-seed, or hellebore, mixed with barley, of which they will eat so as to destroy themselves. As those vermin frequently consume seed-corn after it is deposited in the ground, it has been suggested to steep it in bull's gall, which will impart to it such a bitter taste that they will not touch it. Some persons mix sand with their stacked corn, which deters them from burrowing in it, by falling into the ears. The following method has been found very effectual. Fill an earthen pot half-full of water, and cover it over with a board that has a hole in the middle, then cover the board over with straw, pea-haulm, or similar rubbish; under which the vermin will take shelter, and; creeping to the hole, will fall through and be drowned in the water.



SECT. II. Birds injurious to Agriculture.

6860. Of the *aves*, the species more peculiarly injurious to the agriculturist is the kite, (*Falco milvus*, L.), by its attacks on young poultry. To ensnare them proceed as follows. Near the place where poultry are kept, let iron gins be fixed, about four inches broad, which must be baited with chicken, mice, or raw meat; and thus these ravenous fowls are easily taken. Some persons stretch lines or nets over the place where the fowls are; but nothing drives them away like a well charged gun. Or, steep the entrails of pigs, fowls, or rabbits, in the lees of wine, into which you have infused a quantity of *nux vomica*, and throw the bait where the fowls come in the evening, or early in the morning. This will intoxicate them so that a person waiting near the spot may easily take them.

6861. *All the granivorous birds are injurious to the farmer at seed time and harvest, and must be deterred by watching or shooting, by scare-crows, as figures of men, cats, &c., by rags dipped in bruised gunpowder and tar, renewed every day or two; but chiefly by shooting and fixing up the victims in different places. It must always be recollected that birds are, with very few exceptions, insectivorous as well as granivorous, and that frequently they may do much good in destroying the grub and wire worm. This is more especially the case with the crow tribe, (*Corvus*, L.) (See *Encyc. of Gard.* § 2223.)*

SECT. III. *Insects injurious in Agriculture.*

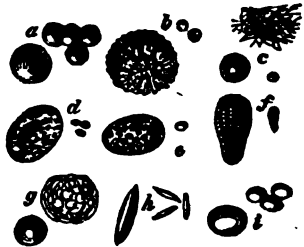
6862. *The insect tribes are by far the most dangerous animals that the agriculturist has to contend with; and injurious as they are in Britain, their destructive effects are here but trifling compared to what is experienced from the locust in eastern countries, and various insects in North America. Dr. Dwight, in his *Travels in New England*, relates accounts of the Hessian fly (*Tipula*), destroying the crops of entire districts, and rendering it impossible to cultivate a particular variety of wheat. It made its first appearance in New England in 1787, and advanced at the rate of 20 miles a year. A caterpillar called the palmer worm appeared in 1770. Its march was from west to east; walls and fences were no obstruction to its course, nor indeed was any thing else, except the sides of trenches. It destroyed, rather than devoured, ascending a stalk of grass, or grain, cutting it off in a moment, and, without staying to eat any part of it, rapidly repeating the same process on all which stood its way. The meadows, where it most abounded, appeared as if they had been mown with a dull scythe; and the grain, as if it had been reaped with a sickle which had gaps, and therefore had cut the stalks in a scattering, slovenly manner. In some places, immense multitudes of these animals died in the trenches, which were formed to stop their progress, and were left uncovered. The mass soon became foetid and loathsome; and was supposed in several instances, to produce a fever distressing, and sometimes fatal. The canker worm, another caterpillar, lives on apple-trees, and entirely strips them of their leaves in the course of four weeks. A sort of grasshopper appears occasionally in vast numbers, and not only eats every thing of the vegetable kind, but even "the garments of labourers hung up in the field while they are at work, which they destroy in a few hours." (*Dwight's Travels*, vol. ii. p. 384.) Every species of larger animal and plant seems to have a particular species of insect which it is destined to support, and to which it will fall a victim unless in vigorous health; and in the case of animals, not only in good health, but in the habit of using the means which nature or art suggests for their suppression or destruction. We shall first offer some general remarks on the nature of insects, and next describe a few belonging to each of the Linnæan orders.*

SUBSECT. 1. *Of the Physiology of the Insect Tribes.*

6863. *Insects are distinguished from quadrupeds, birds, and reptiles by their more numerous feet, being without bones, and by their head being furnished with a pair of antennæ or horns. From the vermes, or worm-like animals, insects are sufficiently distinguished by their having feet.*

6864. *Taking a general view of insects we find most of them are oviparous; of course the first state in which insects appear is that of an ovum or egg. This relates to the generality of insects, for there are some examples of viviparous insects, as in the general aphid, musca, &c. The eggs of insects (fig. 748) are of two sorts: the first membranaceous, like the eggs of the tortoise, and the other reptiles; the other covered with a shell like those of the birds. Their figure varies exceedingly; some are round, some elliptical, some lenticular, some cylindrical, some pyramidal, some flat, some square, but the round and oval are the most common. As an example of the various shapes of the eggs of insects, and of their natural as well as magnified size, we refer to those of the common slug (a), phalæna nupta (b), brown-tailed moth (c), currant moth (d), common gooseberry moth (e), turnip butterfly (f), spider (g), house cricket (h), and common chafer (i).*

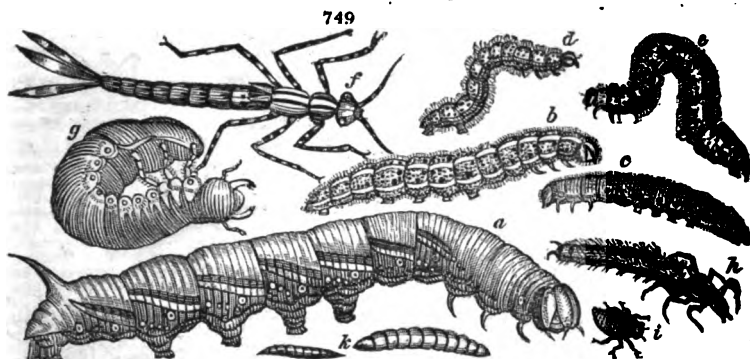
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6865. *The eggs of insects seldom increase in size, from the time they have been deposited by the parent, till they are hatched; those of the tenthredo, however, and of some others, are observed to increase in bulk. At first there is nothing to be perceived in the eggs of insects but a watery fluid; after some little time, the head, like an obscure point, is observable in the centre. The little insect remains in the egg till its limbs have acquired strength to break the egg and make its escape; the different species of insects remain enclosed in the egg for very different periods; some continue enclosed only a few days,*

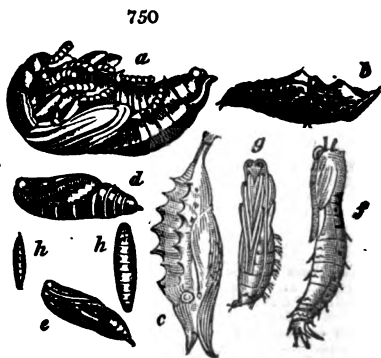
others remain for several months. The eggs of many insects remain without being hatched during the whole winter, and the young insects do not come forth from them till the season at which the leaves of the vegetables on which they feed begin to expand.

6866. The insect in its second or caterpillar state (fig. 749.) has been usually known



by the name of *eruca* or larva, being a sort of masked form or disguise of the insect in its complete state. The larvæ of insects differ very much from each other, according to the several tribes to which they belong; those of the butterfly (*Papilio*) and moth (*Phalena*) tribes are generally known by the name of caterpillars; those of the beetle (*Scarabeus*), except such as inhabit the water, are of a thick, clumsy form, called grubs. The larvæ of the locust or grasshopper (*Gryllus*), do not differ much in appearance from the complete insect; except being without wings. The larvæ of flies (*Musca*), bees (*Apis*), &c. are generally known by the name of maggots, and are of a thick short form. Those of water-beetles (*Dytiscus*) are of very singular forms, and differ, perhaps, more from that of the complete insect than any other, except those of the butterfly tribe. Some insects undergo no change of shape, but are hatched from the egg complete in all their parts, and they undergo no farther alteration than that of casting their skin from time to time, till they acquire the complete resemblance of the parent animal. In the larva state most insects are peculiarly voracious, as are many of the common caterpillars. In their perfect state some insects, as butterflies, are satisfied with the lightest nutriment, while others devour animal and vegetable substances with a considerable degree of avidity. As an example of the caterpillar state of some of the commoner insects, we may refer to that of the privet moth (*Sphinx ligustri*, fig. 749 a); the cabbage butterfly (*Papilio brassica*, b); the turnip butterfly (*P. napi*, c); gooseberry moth (*Phalena wauaria*, d); the currant moth (*Ph. grossularia*, e); the dragon fly (*Libellula virgo*, f); the common chafer (*Scarabeus melolontha*, g); the phryganea rhombica (h); the frog-hopper (*Cicada spumaria*, i); and the musca pumilionis (k).

6867. When the larva is about to change into the chrysalis or pupa state (fig. 750.) it ceases to feed, and having placed itself in some quiet situation, lies still for several hours, and then, by a sort of effort, it divests itself of its external skin, and immediately appears in the different form of a chrysalis or pupa; in this state, likewise, the insects of different genera differ almost as much as the larvæ. In most of the beetle tribe it is furnished with short legs, capable of some degree of motion, though very rarely exerted. In the butterfly tribe it is destitute of legs; but in the locust tribe it differs very little from the perfect insect, except in not having the wings complete. In most of the fly tribe it is perfectly oval, without any apparent motion or distinction of parts. The pupa of the bee is not so shapeless as that of flies, exhibiting the faint appearance of limbs. Those of the dragon fly (*Libellula*) differ most widely from the appearance of the complete insect; from the pupa emerges the image or insect in its ultimate form, from which it never changes, nor receives any farther increase of growth. As examples of the chrysalis of various insects, we give those of the beetle (*Scarabeus*



melonantha, fig. 750 a), papiliò napi (b), P. Io (c), *phalæna grossularia* (d), *Ph. wavaria* (e), *tipula cornicina* (f), *phryganea rhombica* (g), *musca pumilionis*, natural size and magnified (h h).

6868. *The sexes of insects* are commonly two, male and female. Neuters are to be met with among those insects which live in swarms, such as bees, ants, &c. As examples of the appearance of different insects in regard to sex, we refer to the male, female, and neuter ant (fig. 751 a, b, c), and to the male or drone, female or queen, and neuter or working bee (d, e, f).

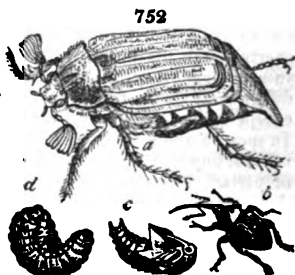
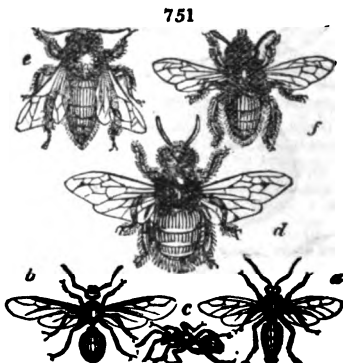
6869. *In duration*, the majority of insects are observed to be annual, finishing the whole term of their lives in the space of a year or less, and many do not live half that time; nay, there are some which do not survive many hours; but this latter period is to be understood only of the animals when in their complete or ultimate form, for the larvæ of such as are of this short duration have in reality lived a long time under water, of which they are natives; and it is observed, that water insects in general are of longer duration than land insects. Some few insects, however, in their complete state, are supposed to live a considerable time, as bees for instance; and it is well known that some of the butterfly tribe, though the major part perish before winter, will yet survive that season in a state of torpidity, and again appear and fly abroad in the succeeding spring; spiders are also thought to live a considerable time.

6870. *The arrangement of insects*, according to the Linnæan system, is divided into seven orders. The natural orders and families into which they have been divided by subsequent naturalists are very numerous; and therefore, we shall notice only the artificial orders of Linnæus, viz. 1. Coleoptera; 2. Hemiptera; 3. Lepidoptera; 4. Neuroptera; 5. Hymenoptera; 6. Diptera; and 7. Aptera. The leading characters of these orders, and the names of the genera belonging to them which are most noxious to plants in a state of culture, will be of some use in enabling the agriculturist to use a correct nomenclature, as well as to enlighten him generally on the intricate and little understood subject of insects.

SUBJECT. 2. Of Coleopterous Insects.

6871. *The coleoptera* have a hollow horny case, under which the wings are folded when not in use. The principal genera are 1. *Scarabæus* (beetles); 2. *Lucanus* (stag-beetle); 3. *Dermestes*; 4. *Coccinella* (lady-bird); 5. *Curculio* (weevil); 6. *Lampyrus* (glow-worm); 7. *Meloe* (Spanish fly); 8. *Chrysomela*; 9. *Forficula* (earwig). Like other winged insects, all the beetles live for some time in the form of caterpillars, or grubs. The caterpillars of the garden-beetle, cockchafer, &c. lead a solitary life under ground, and consume the roots of plants; those of others feed upon putrid carcases, every kind of flesh, dried skins, rotten wood, dung, and the small insects called pucerons, or vine-fretters. But after their transformation into flies, many of the same animals, which formerly fed upon dung and putrid carcases, are nourished by the purest nectareous juices extracted from fruits and flowers. The creatures themselves, with regard to what may be termed individual animation, have suffered no alteration. But the fabric of their bodies, their instruments of motion, and the organs by which they take their food, are materially changed. This change of structure, though the animals retain their identity, produces the greatest diversity in their manners, their economy, and the powers of their bodies.

6872. *Of beetles the scarabæus melonantha* (fig. 752 a), is the most common. The eggs are deposited in the ground by the parent insect, whose fore legs are very short, and well calculated for burrowing. From each of these eggs proceeds, after a short time, a whitish worm with six legs, a red head, and strong claws, which is destined to live in the earth under that form for four years, and there undergoes various changes of its skin, until it assumes its chrysalid form. These creatures, sometimes in immense numbers, work between the turf and the soil in the richest meadows, devouring the roots of the grass to such a degree that the turf rises, and will roll up with almost as much ease as if it had been cut with a turning-knife: and underneath, the soil appears turned into a soft mould for above an inch in depth, like the bed of a garden. In this the grubs lie, in a curved position, on their backs, the head and tail uppermost, and the rest of the body buried in the mould. Such are the devastations committed by the grubs of the cockchafer, that a whole field of fine flourishing grass, in the summer time, became in a few weeks withered, dry, and as brittle as hay, by these grubs devouring the roots, and gnawing away all those fibres that fastened it to the



ground, and through which alone it could receive nourishment. The larvæ having continued four years in the ground, are now about to undergo their next change: to effect this, they dig deep into the earth, sometimes five or six feet, and there spin a smooth case, in which they change into a pupa or chrysalis. They remain under this form all the winter, until the month of February, when they become perfect beetles; but with their bodies quite soft and white. In May the parts are hardened, and then they come forth out of the earth. The most efficacious mode of preventing their increase is to employ proper persons to take the flies in May and June, before they have laid their eggs; which, though it appears an endless task, may be done with very considerable effect, by shaking and beating the trees and hedges in the middle of the day. Domestic fowls of all kinds are particularly fond of these beetles, so that the expense of collecting them by children would be in some degree compensated by the quantity of food they would afford in this way. When land is ploughed up in the spring, if the weather be warm, hundreds of the chafer grubs are exposed, in which case, rooks, gulls, and jays will be sure to detect and devour them. These birds, therefore, should not be driven away, as the occasional damage they commit is amply repaid by their unceasing exertions to destroy various insects. The almost sole employment of rooks, for three months in the spring, is to search for this sort of food, and the havoc that a numerous flock makes amongst them must be very great.

6873. The *Chrysomela*, L. is distinguished by its moniliform antennæ, six feelers, and oval scaly body. The species are beautiful, and exceed 350 in number. The turnip fly is referred to this genus by some, and by others to aphidæ: the fact is, the turnip is liable to the attacks of both. *Coccinella*, the lady-bird, is harmless in respect to plants.

6874. The *weevil* (*Curculio*) is a very numerous and splendid genus; the larvæ of some infest granaries, others may be found inside of artichoke and thistle flowers. All the species feed on the seeds or leaves of vegetables. One of the most common is the nut-weevil (*C. nucum*, fig. 752 b), of which the larvæ (c) and pupæ (d) are both nearly of the size of the perfect insect.

6875. *Dytiscus* and *hydrophilus* are aquatic genera, inhabitants of ponds and stagnant waters, they swim with great dexterity; their hind legs are particularly fitted for their residence in the water, being thin and flat, and having the inner edges furnished with stiff hair-like appendages which act as fins or oars; the males are distinguished from the females, by having a horny flap or shield on the fore legs, near the setting on of the feet. The larvæ (as is common with aquatic insects) remain a long time in the imperfect state, some two to four years; they secrete themselves in holes in banks, and devour other insects, worms, and the young fry of fish, which they destroy by sucking out their juices.

6876. The *carwig* (*Forficula*) frequents moist ground, is very injurious to flowers and fruit, and may easily be taken by suspending any hollow article on a plant or twig, as it retires in the daytime to such retreats, and feeds mostly during the night.

SUBSECT. 3. Of Hemipterous Insects.

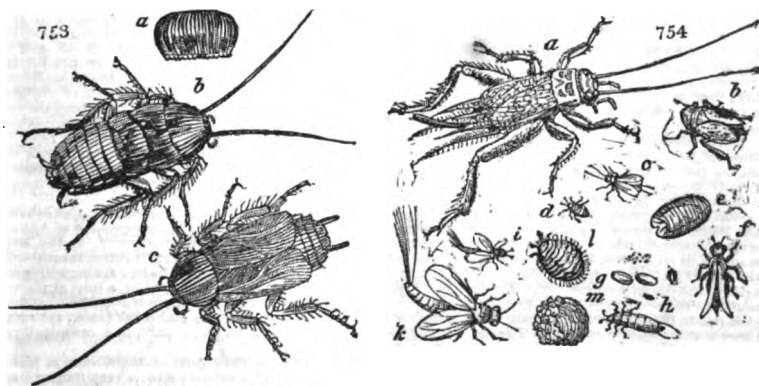
6877. The *hemiptera* are all furnished with wing covers of a softer texture than the *coleoptera*; these covers do not meet in a direct line as in that order, but the base of the left wing covers the inner margin of the right; in some, the wings nearly cross at the tips; the mouth is either situated on the breast or inclining towards it. The principal genera are; 1. *Blatta* (cock-roach); 2. *Gryllus* (locust, grasshopper); 3. *Fulgora* (lantern-fly); 4. *Cimex* (bug, &c.)

6878. Of the *cock-roach* (*Blatta*) many species are exceedingly injurious, devouring most kinds of provisions, paper, leather, and vegetable substances; they are generally nocturnal insects, and are found in great abundance in bakehouses, and other warm places. They are all killed without any external injury, by immersion in boiling water.

6879. The *black cock-roach*, improperly called the black beetle (*B. orientalis*, fig. 753), was originally a native of South America, but is now very generally spread throughout Europe. It cannot be considered a British insect, though it frequents kitchens, ovens, and warm places, and devours meal, bread, and other provisions, shoes, &c. It conceals itself during the day, and comes abroad in the night; it runs quickly, and is very tenacious of life. It is killed by red wafers. The egg (a) is of a considerable size, and the pupa (b) larger than the perfect insect (c).

6880. The *gryllus* genus comprehends a number of species, some of which are called grasshoppers, others locusts, and others crickets. The caterpillars of the grylli have a great resemblance to the perfect insects, and, in general, live under ground. Many of these insects feed upon the leaves of plants; others, which live in houses, prefer bread and every kind of farinaceous substance.

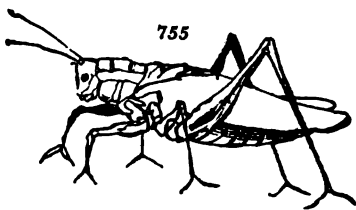
6881. The *house-cricket* (*G. domesticus*, fig. 754 a) is one of those busy little insects that reside altogether in



our dwellings, and intrude themselves on our notice, whether we wish it or not. They are partial to houses newly built, for the softness of the mortar enables them to form their retreats, without much difficulty, between the joints of the masonry, and immediately to open communications with the different rooms. They are particularly attached to kitchens and bakehouses, as affording them a constant warmth. In some of the warmer countries, this genus of insects is of all the pests that mankind are subject to, the most injurious, destroying vegetables of every kind, and even from their numbers alone,

constituting one of the heaviest afflictions that can happen to a country. The mischief done by the blattæ, or cock-roaches, is trifling compared with those of this destroying tribe, for the dreadful ravages committed by the locusts are such as to reduce the most fertile fields to the appearance of barren deserts; they devour the fruits, leaves, and even the buds and bark of trees, and have even been known to devour the reeds used in thatching the human habitations, so unfortunate as to be visited by these devouring hordes. Jackson depicts their ravages in the empire of Morocco, and gives a figure of the insect (fig. 755.) of half the natural size. In Abyssinia, China, and other countries, the caterpillar or larva of certain species of roaches and locusts is, like that of some beetles, eaten by the natives.

6682. A species of grasshopper apparently peculiar to New England is mentioned by Dr. Dwight, as appearing periodically. He says, "As I had no opportunity of examining them, I cannot describe their form or their size. Their favorite food is clover and maize. Of the latter, they devour the part which is called the silk, the immediate means of fecundating the ear, and thus prevent the kernel from coming to perfection. But their voracity extends to almost every vegetable, even to the tobacco plant and the burdock. Nor are they confined to vegetables alone. The garments of laborers, hung up in the field while they are at work, these insects destroy in a few hours, and with the same voracity they devour the loose particles which the saw leaves upon the surface of pine boards, and which, when separated, are termed saw-dust. The appearance of a board fence, from which the particles had been eaten in this manner, and which I saw, was novel and singular, and seemed the result, not of the operations of the plane, but of attrition, the cause of which I was unable to conjecture. At times, particularly a little before their disappearance, they collect in clouds, rise high in the atmosphere, and take extensive flights, of which neither the cause nor the direction has hitherto been discovered. I was authentically informed in Shaftsbury, that some persons, employed in raising the steeple of the church in Williamstown, were, while standing near the vane, covered by them; and saw at the same time vast swarms of them flying far above their heads. The customary flight of grasshoppers rarely exceeds four or five yards, and their wings are apparently so weak as to forbid excursions extended much beyond these limits. It is to be observed, however, that they customarily return, and perish on the very grounds which they have ravaged." (Dwight's Travels, &c. vol. ii. p. 385.)



6683. The frog-hopper, or cuckoo-spit insect, (*Cicada*), feeds on various kinds of plants; the grub or larva is without wings; in the pupa the wings are very short; but in both states they are exceedingly active. The males are distinguishable by their loud chirping note; the females are quite mute. In the fly state, they are found on the leaves and stems of plants, and in the immature state about the roots of grass and trees. The white froth-like spittle, which is seen on the leaves and stalks of many kinds of plants in the summer season, is produced by the black-headed frog-hopper (*Cicada spumaria*, fig. 754 b), and if this froth be wiped off and examined, it will be found to contain the larva or young of the cicada; and this matter, which is discharged from its own body, no doubt serves to protect it from the attacks of other insects.

6684. The plant-louse, vine-fretter, or puceron, (*Aphis*) is a very common insect, the numerous species being denominated from the trees and plants which they infest. The males are winged, and the females without wings; they are viviparous, producing their young alive in the spring; and also oviparous, laying eggs in the autumn. As these insects derive their nourishment from the juices of the plants which they infest, nature has wisely ordained that the females should lay eggs in the autumn, though they bring forth their young alive all the spring and summer months. This is to prevent them from being starved for the want of food in winter. The young burst forth from their eggs in spring as soon as there are leaves to subsist upon. Their noxious effects are well known to the gardener. They sometimes migrate, and suddenly fall in showers on spots that were until then free from their ravages. Water dashed with force from a syringe will prove as destructive to them as any thing when on trees; and smaller plants may be washed with lime-water, with tobacco-water, with elder leaves infused in water, or with common soap-suds, any of which will destroy the insects. The larvae of the lady-bird eat thousands of them, some species of ichneumon and common ants also destroy them; and some conjecture that it would probably prove serviceable to scatter ants, which may always be procured in abundance, upon infested trees. The aphides sometimes settle upon the tops of beans, covering them so thickly as to make them appear quite black: in such cases the crops may often be preserved by cutting off the tops, a practice which is likewise adopted, independently of this pest requiring it, for the purpose of increasing the yield of beans. (Dr. Skrimshire's Essays, Introd. to Nat. Hist., vol. i. p. 149.) The rose-tree is, after a mild spring, greatly injured by a species of aphid (*A. rose*). The best mode of remedying this evil is to lop off the infested shoots before the insects are greatly multiplied, repeating the same operation before the eggs are deposited. By the first pruning a very numerous increase will be prevented, and by the second, the following year's supply may, in a great measure, be cut off. If it were not for the numerous enemies to which the aphid is exposed, their wonderful fecundity is such that the leaves, branches, and stems of every plant would be totally covered with them. Myriads of insects of different classes, of different genera, and of different species, seem to be produced for no other purpose than to devour the aphid. On every leaf inhabited by them we find caterpillars of different kinds. These feed not upon the leaves, but upon the pucerons, whom they devour with an almost incredible rapacity. Some of these larvae are transformed into insects with two wings, others into flies with four wings, and others into beetles. While in the larva state one of these glutinous insects will suck out the vitals of twenty pucerons in a quarter of an hour. Reaumur supplied a single caterpillar with more than a hundred pucerons, every one of which it devoured in less than three hours.

6685. The chermes (fig. 754 c, d, e) is a genus very generally confounded with aphid; it also inhabits the leaves and stems of plants, and by its punctures, produces excrescences and protuberances of various sizes and shapes, which are generally found to enclose either the egg or immature insect, in the larva state; it is six-footed, hairy or woolly, and without wings; and in the pupa are two protuberances from the thorax, which are the rudiments of the future wings. The winged insects (c) leap or spring with great agility, and infest a number of different trees and plants: the females (d), by means of a tube at the termination of their bodies, insert their eggs under the surface of the leaves; and the worms, when hatched, give rise to those tubercles, or galls, with which the leaves of the ash, the fir, and other trees, are sometimes almost entirely covered. The old females, before depositing their eggs, expand to a comparatively large size (e).

6686. The thrips genus (fig. 754 f.) consists of very small insects, found chiefly on the flowers of plants, and, excepting when very numerous, are not very detrimental. The natural size is very minute, and therefore to search for this insect a magnifying glass is required.

6687. Of the cochineal or coccus genus (fig. 754 g.) there are several species very injurious in gardens, the peach, vine, pine, and orange bugs. They are very well known to gardeners, and are almost exclusively found in hot-houses. The males are active, but the females are very inert, being generally fixed to different parts of plants. The eggs, of their natural size, are mere dots, magnified (g) they appear of an oval shape; the larva is proportionally small, but magnified (h) is oblong and roundish; the males (i) only have wings, and require to be magnified to show their form (k); the female attains a considerable size (l), and,

when hatching, becomes enveloped in a case of wool (*wo*). Brushing off these creatures is the only effectual remedy, and, if set about at once and persevered in, will save the trouble of many prescribed washes and powders, which are mere palliatives. Happily the British agriculturist has little to do with them.

SUBSECT. 4. *Of Lepidopterous Insects.*

6888. *The lepidoptera* contains the butterfly, moth, and hawk-moth; they have four wings covered with scales or a sort of farina; they have a mouth, with palpi, a spiral tongue, and the body covered with hair. The scales resemble feathers; they lie over one another in an imbricated manner, the shaft towards the body of the insect, and the expansion towards the end of the wing, reflecting the most brilliant colors.

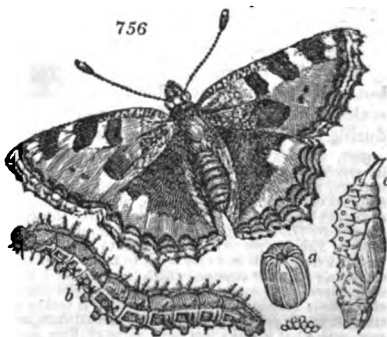
6889. *Of the butterfly genus (Papilio, L.)* many thousand species are known in Europe, and in England alone more than eleven hundred have been collected by one celebrated entomologist.

—6890. *The larvae, or young, of the different kinds of butterflies and moths, when in that state in which they come from the egg, are called caterpillars.* These, which are very minute at first, feed generally on the leaves of vegetables, and increase in size. They cast their skins occasionally, and sometimes change in color and markings, but never in their general appearance or in their habits. Eating seems to be their sole employment; and when they meet with food that suits their palate they are extremely voracious, committing great havoc in gardens. But the same cause which restrains the depredations of the aphides and other insects has also set bounds to the destruction occasioned by the caterpillar, who has myriads of internal as well as external enemies. Many flies deposit their eggs in the bodies of caterpillars. From these eggs proceed small maggots, which gradually devour the vitals of the animal in which they reside. When about to be transformed into chrysalids, they pierce the skin of the caterpillar, spin their pods, and remain on the empty skin till they assume the form of flies, and escape into the air to perform the same cruel office to another unfortunate larva. Every person must recollect to have seen the colewort or cabbage caterpillar stuck upon old walls, or the windows of country cottages, totally covered with these chrysalids, which have the form of small maggots, and are of a fine yellow colour. One of the most formidable enemies of the caterpillar is a black worm, with six crustaceous legs: it is longer and thicker than an ordinary-sized caterpillar. In the fore part of the head it has two curved pincers, with which it quickly pierces the belly of a caterpillar, and never quits the prey till it is entirely devoured. The largest caterpillar is not sufficient to nourish this larva for a single day; for it daily kills and eats several of them. These gluttons, when gorged with food, become unactive, and almost motionless; when in this satiated condition, young larvae of the same species attack and devour them. Of all trees, the oak perhaps nourishes the greatest number of different caterpillars, as well as of different insects. Among others, the oak is inhabited by a large and beautiful beetle. This beetle frequents the oak, probably because that tree is inhabited by the greatest number of caterpillars. It marches from branch to branch, and, when dispossessed for food, attacks and devours the first caterpillar that comes in its way.

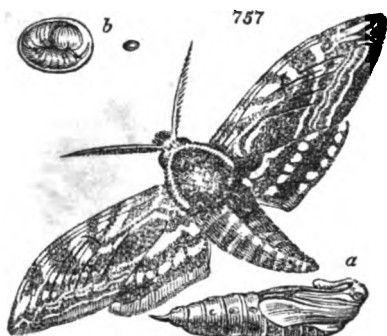
6891. *Chrysalis state.* When full grown, the caterpillar seeks some retreat, to prepare for an important change, viz. from the soft caterpillar, possessing motion and feeding so voraciously, to the hard chrysalis, fixed immovably, and sustained without food. The retreat that is chosen and the preparation that is made for this important change vary essentially in different species: some retire to the sheltered situations of houses, walls, and other buildings; some bury themselves in the ground; some wrap themselves up in leaves; others attach themselves to the stalks of plants; while others again eat into the stems of vegetables, or the very heart of trees, and there undergo their metamorphosis. Although each kind of caterpillar seeks a different retreat, yet all of the same species seek the same, and adopt the same means of preservation. Such as are to lie dormant all winter, seek the warmth of our houses, or dig their way into the ground, below the influence of the expected frosts. Such as are to leave their prisons in a few weeks, and before the end of summer, roll themselves up in the leaves of those plants on which they fed. No caterpillar that is to remain in the state of a chrysalis till the following summer, attaches itself to an annual plant; and none that is to enter on its winged state in winter (which some few do) is ever found but upon evergreens. In the preparation which is made for their metamorphosis, caterpillars differ as much as in their selection of a proper place. Some attach themselves by a thread from their tails, and are suspended perpendicularly; while others, among which is the white cabbage butterfly, by another thread across the body, are suspended horizontally. The silk-worm and several others spin a complete covering or case for their bodies, some of finer materials and less agglutinated together than others. Some caterpillars form a ball or nest of the mould in which they are buried, glued together by their saliva, and smoothed within; and others fasten two leaves together, or, curling its edges, unite two parts of the same leaf by threads and bands, and thus form a covering and safe retreat for themselves.

6892. *Perfect insect.* After the animal has lain dormant its due time in the chrysalis state, the skin or shell bursts, and the perfect insect, in its winged state, creeps out, gradually expands its wings, and, when dried, becomes a gay inhabitant of the air. It now no longer seeks to satisfy its hunger on the gross food that it devoured when a caterpillar, but sips the nectar from the blossoms of the flowers. Having fulfilled the intentions of nature, they deposit their eggs with care, and, having thus provided for a future generation, the insect terminates its short but brilliant career. In the deposition of their eggs, the parent butterflies and moths display wonderful instinct in selecting precisely such places as are best adapted to their future young; such plants, for instance, as will furnish food for the new-born caterpillars, and such parts of plants as are not likely to be removed by decay, or such as will be exactly in the required stage of maturity at the time when the caterpillars are to be born. Thus, a little insect (*Times poems*) lays its eggs in the blossom, that its caterpillar may feed on the fruit of the apple; and several others act in the same provident way.

6893. *The most remarkable British butterflies* are—the purple emperor (*Papilio iris*), which appears in July, and is considered the most beautiful: the peacock butterfly, (*P. Io*), whose wings are of a brownish-red color with black spots, is sufficiently common in the south of England, but extremely rare in the north: the tortoise-shell butterfly (*P. urtica*, fig. 756.) which appears in its winged state about the month of April, is one of the most common, at the same time the most beautiful of the British lepidoptera; the upper wings are red, and marked with alternate bands of black and pale orange; the eggs (*a*), caterpillar (*b*), and chrysalis (*c*) are each elegant in their kind. The masarine blue butterfly (*P. cymon*) is also an admired species.

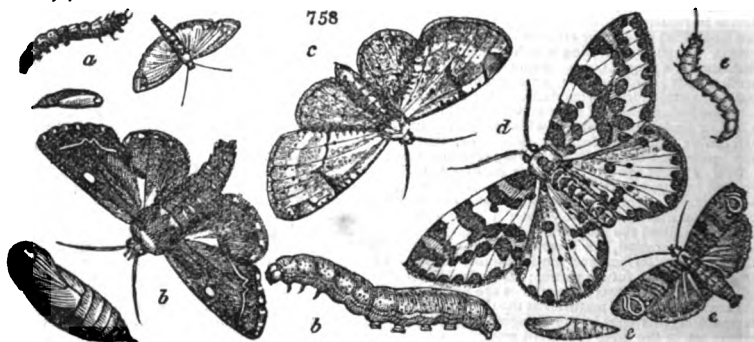


6894. The hawk-moth, sphynx, or sphinx, is chiefly seen in the evening. The name sphynx is applied to the genus on account of the posture assumed by the larvæ of several of the larger species, which are often seen in an attitude much resembling that of the Egyptian sphynx, with the fore parts elevated, and the rest of the body applied flat to the surface. One of the most elegant insects of this genus is the privet hawk-moth (*Sphinx ligustri*, fig. 757.), measuring nearly four inches and a half from wing's end to wing's end. The caterpillar (fig. 748 a), which is very large, is smooth, and of a fine green, with seven oblique purple and white stripes along each side: at the extremity of the body, or top of the last joint, is a horn or process pointing backwards. This beautiful caterpillar is often found in the months of July, and August, feeding on the privet, the lilac, the poplar, and some other trees, and generally changes to a chrysalis (fig. 757 a) in August or September, retiring for that purpose to a considerable depth beneath the surface of the ground; and after casting its skin, continuing during the whole winter in a dormant state, the sphinx emerging from it in the succeeding June. The egg of the sphinx (b) is very different from that of the papilio. Another perhaps still more beautiful insect is the sphinx ocellata, or eyed hawk-moth, which is principally found on the willow-tree, in its perfect state, in the month of June. The largest and most remarkable of the British hawk-moths, is the sphinx atropos, or death's head hawk-moth. The upper wings are of a fine dark-grey color, with a few slight variegations of dull orange and white; the under



wings are of a bright orange color, marked by a pair of transverse black bands: the body is also orange-colored, with the sides marked by black bars: on the top of the thorax is a very large patch of a most singular appearance, exactly resembling the usual figure of a skull, or death's head, and of a pale grey, varied with dull ochre color and black. When in the least disturbed or irritated, this insect emits a stridulous sound, sometimes like the squeaking of a bat or mouse; and from this circumstance, as well as from the mark above mentioned, is held in much dread by the vulgar in several parts of Europe, its appearance being regarded as a kind of ill omen, or harbinger of approaching fate. The caterpillar from which this curious sphinx proceeds, which is principally found on the potatoe and the Jessamine, is in the highest degree beautiful, measuring sometimes five inches in length; its color is a bright yellow, and its sides are marked by stripes of a mixed violet and sky-blue color. It usually changes into a chrysalis in the month of September, and emerges the complete insect in June or July following: some individuals, however, change in July or August, and produce the moth in November.

6895. The moths (*Phalæne*) are a numerous genus like the sphinges. They fly abroad only in the evening and during the night, and obtain their food from the nectar of flowers. The larva is active and quick in motion, and preys voraciously on the leaves of plants. The most remarkable British moths are the clothes-moth (*P. sarcitella*, fig. 758 a); the eggs of which are deposited on woollen clothes, furs, &c. on which the larvæ feed and change to chrysalids, appearing in the imago state in August. The most troublesome in gardens are the cabbage-moth (*P. oleracea*, b); the gooseberry-moth (*P. wavaria*, c); the currant-moth (*P. grossularia*, d); and the codling-moth, common on fruit-trees, hedges, and oak-trees, (*P. pomonella*, e).



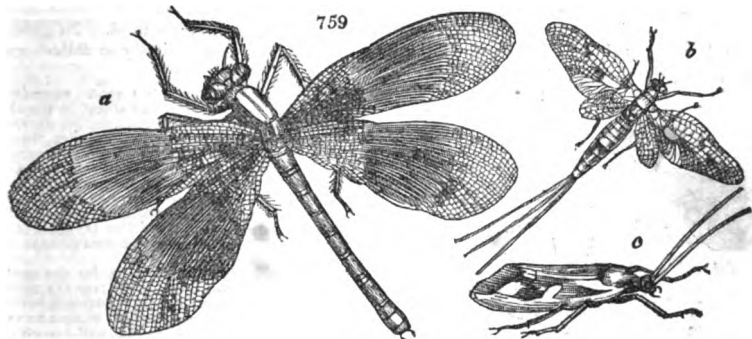
SUBSECT. 5. Of Neuropterous, or Nerve-winged Insects.

6896. The neuroptera, or nerve-winged insects, have four naked membranaceous wings, but no sting; and they differ from the last order, as their wings are without their minute scales or down. Most of the insects in this family are aquatic, residing in the water during their immature state, and resorting thereto in their perfect state.

6897. The dragon-fly (*Libellula*) is well known as frequenting rivers, lakes, pools, and stagnating waters, in which the females deposit their eggs. The egg, when deposited by the parent in the water, sinks to the bottom, and remains there till the young insect has acquired sufficient maturity and strength to burst from its confinement. The larva, at first small, increases to nearly half the size of the perfect fly, by changing its skin at different intervals, like the caterpillars of moths and butterflies. The slender-bodied dragon-fly (*L. virgo*, fig. 759 a.) is the most common.

6898. The day-fly (*Ephemera*) differs in many respects from all other insects. The larvæ live in the water, where earth and clay seem to be their only nourishment, for three years, the time they consume in preparing for their change, which is performed in a few moments. The larva, when ready to quit that state, rises to the surface of the water, and getting instantaneously rid of its skin, becomes a chrysalis. This chrysalis is furnished with wings, which it makes use of to fly to the nearest tree or wall; and there settling, it in the same moment quits a second skin, and becomes a perfect ephemera. In this state all the species live but a very short time, some of them scarcely half an hour, having no other business to perform than that of continuing the race. They are called the insects of a day; but very few of them ever see the

light of the sun, being produced after sunset, during the short nights of summer, and dying long before the dawn. All their enjoyments, therefore, excepting coition, are confined to their larva state. The *E. vulgata* (fig. 759 b) is the largest British species.



6899. The spring fly (*Phryganea*), in the caterpillar state, lives in the water, and is covered with a silken tube. The caterpillars or larvæ have a very singular aspect; for, by means of a gluten, they attach to the tubes in which they are enclosed small pieces of wood, sand, gravel, leaves of plants, and not unfrequently live on testaceous animals, all of which they drag along with them. They are very commonly found on the leaves of the water-cress; and, as they are often entirely covered with them, they have the appearance of animal plants. They are in great request among fishermen, by whom they are distinguished by the name of stone or cod-bait. The fly, or perfect insect, frequents running water, in which the females deposit their eggs. *P. rhombica* (fig. 759 c) is common.

SUBSECT. 6. Of Hymenopterous Insects.

6900. The order hymenoptera, or four-winged insects with stings, includes the gall insect, wasp, bee, ant, &c. At the extremity of the abdomen, the females of several of the genera have an aculeus or sting, that lies concealed within the abdomen, which is used as a weapon, and instils into the wound an acrid poison: those which want the sting are furnished with an oviduct that is often serrated, and with which the eggs are deposited, either in the bodies of the caterpillars of other insects, or in wood. From these eggs the larvæ are produced, which in some have no feet, in others more than sixteen. They change to pupæ incompletæ, which are enclosed in cases. Some of the insects of this order live in societies, others are solitary.

6901. The gall-fly (*Cynips*) pierces the leaves, &c. of plants with its sting, and deposits its eggs in the wound; the extravasated juices rise round it, and form a gall (fig. 760 a) which becomes hard; and in this the larva (b) lives and feeds, and changes to a pupa (c c), and afterwards to the imago or perfect insect (d). The *C. quercus folii* (fig. 760 d), and *C. glechomatis*, or ground-ivy gall-fly, are very common.

6902. The saw-fly (*Tenthredo*), in the larva state (fig. 760 e), bears a strong resemblance to some of the caterpillars of the lepidopterous insects; but is distinguishable by the number of the feet, which are never fewer than sixteen, exclusive of the thoracic pairs; the larvæ feed on the leaves of plants, and the pupa is enclosed in a strong gummy case (f), retiring in the autumn, and the perfect fly (g) emerges early in the ensuing spring. The serrated sting is used by the female in the manner of a saw, to make incisions in the twigs, or stems of plants, where it deposits its eggs. *T. roseæ* (fig. 760 e, f, g), is a common species. The *T. grossularis* (h) is also frequent in gardens; both are very troublesome species of this genus.

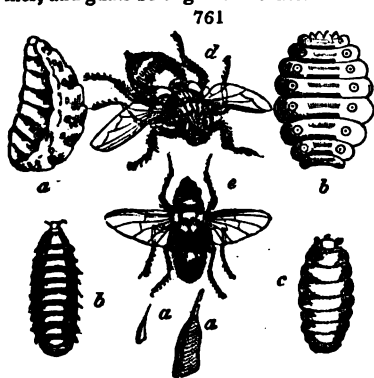
6903. The ichneumon is a very numerous genus, there being upwards of 800 British species. The eggs, in most kinds, are deposited in the bodies of caterpillars or pupæ, which are there hatched: the larvæ have no feet; they are soft and cylindrical, and feed on the substance of the caterpillar; this last continues to feed and even to undergo its change into a chrysalis, but never turns to a perfect insect: when the larvæ of the ichneumon are full grown they issue forth, spin themselves a silky web, and change into a pupa incompleta, and in a few days the fly appears. The *I. manifestator* (fig. 760 h) is common in woods.

6904. The bee (*Apis*), wasp (*Vespa*), and ant (*Formica*), are well known. All the species of ant are of three sorts, male, female, and neuter. The neuters alone labor; they form the ant-hill, bring in the provisions, feed the young, bring them to the air during the day, carry them back at night, defend them against attacks, &c. The females are said to be retained merely for laying eggs, and as soon as that is accomplished they are unmercifully discarded. The males and females perish with the first cold; the neuters lie torpid in their nest, and thus nature compensates them by duration, what it denies them in antemity of enjoyment.

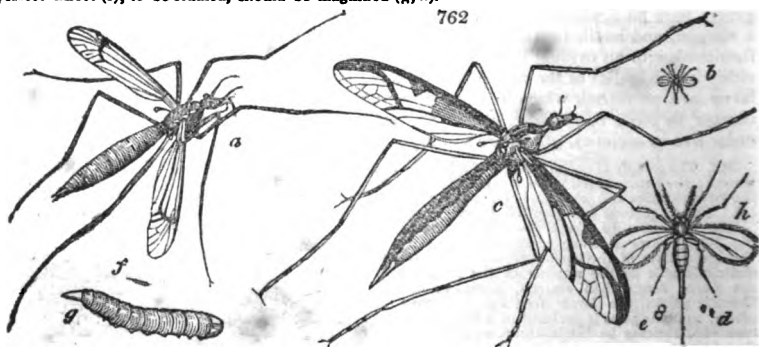
SUBSECT. 7. Of Dipterous Insects.

6905. The diptera, or two-winged insects, have two wings, and behind or below them two globular bodies, supported on slender pedicles, called halteres or poisers. At the

mouth they have a proboscis, sometimes contained in a vagina, and sometimes furnished at its sides with two palpi, but no maxilla. Their eyes are reticulated and large. The females, in general, lay eggs, but some are viviparous; the larvæ of the insects of this order are as various in their appearance as the places in which they are bred. In general they do not cast their skins, but change into a pupa state. Flies, strictly so called, gad-flies, and gnats belong to this order.



single ear of wheat, would soon become of serious injury to mankind, were not their race kept within due bounds by several natural enemies, particularly the ichneumon tipule. The well-known gaffer long-legs, so frequently seen in houses in the autumnal evenings, flying about the flame of the candles, and often perishing in the blaze, is the *T. rivosus* (c), one of the largest species of the genus. The eggs of the wheat-fly (d) are very small: when magnified they appear roundish (e); the larvæ also (f), and the perfect insect (b), to be studied, should be magnified (g, h).



6908. The fly genus (*Musca*) presents many curious species. The common flesh-fly (*M. vomitoria*, fig. 763 a) deposits its eggs on the meat in our stables and launders. These eggs (b) speedily become larvæ (c) are soon full grown (d), change to the chrysalis state (e), and in a month the fly appears (a). The rapid multiplication of the fly is thus calculated by Leuwenhoeck.

"Let us suppose, that in the beginning of June there shall be two flies, a male and a female, and the female shall lay 144 eggs, which eggs, in the beginning of July, shall be changed into flies, one half males and the other half females, each of which females shall lay the like number of eggs; the number of flies will amount to 10,000: and, supposing the generation of them to proceed in like manner another month, their number will then be more than 700,000, all produced from one couple of flies in the space of three months." The Hessian fly (*M. pupilionis*, f) is very destructive to wheat and rye, and has occasionally been a source of great alarm to our agriculturists. The cheese-fly (*M. putris*, g), well known to housewives under the name of hopper, deposits its eggs in the crevices or holes of the cheese, whence those numerous maggots (h), that so much amuse us by their agility and surprising leaps. One of these insects, not a quarter of an inch in length, has been known to leap out of a box six inches deep. The chrysalis (i) is straight and crusty.

6909. The gnat (*Culex*) is frequently in the neighborhood of waters and marshy places. In southern regions there is a large species, which is known by the name of mosquito. Its bite is painful, raising a considerable degree of inflammation, and its continual piping note is exceedingly irksome where it abounds, especially during the night. When it settles to inflict the wound and draw the blood, it raises its hind pair of feet. In Lapland, the injuries the inhabitants sustain from it are amply repaid by the vast number of water-



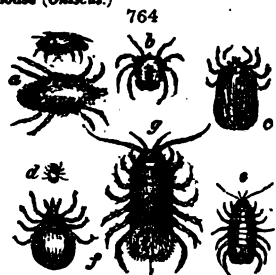
few and wild-few) which it attracts, as it forms the favorite food of their young. The fecundity of the common gnat (*C. pipiens*, fig. 763 k) is as remarkable as that of the flesh-fly.

6910. The *tabanus* genus greatly resembles *musca*, and produces some species troublesome to men and other animals, on whose blood they feed. The *spider-fly* (*Hippoboscæ*) inhabits woods. The species known as the *forest-fly* (*H. equina*, fig. 763 l) is particularly tormenting to the horse.

SUBSECT. 8. Of Apterous Insects.

6911. The *aptera*, or insects without wings in both sexes, is composed of genera of such varied forms, that no other general characters can be affixed. Linneus comprehended in this order spiders, lice, lobsters, crabs, shrimps, &c. which Leach and most other modern naturalists class separately.

6912. The *louse* (*Pediculus*) and *flea* (*Pulex*) are well known: the only genera of this order which are troublesome to the cultivator are the mite-spider (*Acarus*), the common spider (*Aranea*), and the wood-louse (*Oniscus*.)



6913. The *red spider* is the *Acarus telluricus*, L. (fig. 764 a), and the same name is also applied by gardeners to the scarlet acarus (*A. holosericeus*, L. b), the only two British species of the genus which infest plants, and to which perhaps they do more injury than all other insects put together. Watering over the leaves is the well known preventive and remedy: the water should be applied to both sides of the leaf in a finely divided state, and with great force, so as to dash the insects to the ground. For this purpose Read's syringe is the most efficient implement at present in use. The sheep-tic (*A. reduvius*, c), the dog-tic (*A. ricinus*, d), the cheese-mite (*A. siro*), and the itch-mite (*Mite de la gale*, Fr.), (*A. erucicæ*, L.), which inhabits the ulcers of the itch, are the principal species mentioned by Linneus; but some naturalists consider that every animal, and most plants, have their peculiar species of acarus. The harvest-bug is considered by some an acarus, and by others a phalangium.

6914. The *common spider* (*Aranea*) is a numerous genus, and very prolific: as they live entirely on insects, they cannot be considered as otherwise injurious to the cultivator than by their unsightly appearance.

6915. The *wood-louse* (*Oniscus*), is of retired habits, shunning the light and the heat of the sun. It lives on leaves, fruit, and also on animal substances, and casts its crust or skin like the spider. In general it is easily caught by bundles of reeds or beans, or other hollow stalks, like the earwig. The *O. aquaticus* (e) is common in springs and clear ponds, or cisterns of water. The dog-tic and water oniscus (f, g) both require to be magnified to be studied properly.

SUBSECT. 9. Operations for subduing Insects.

6916. The *operations for destroying insect vermin*, or counteracting their injurious effects, are of three kinds, preventives, palliatives, and efficient processes.

6917. The *preventive operations* are those of the best culture in the most extensive sense of the term, including what relates to choice of seed or plant, soil, situation, and climate. If these are carefully attended to, it will seldom happen that any species of insect will exist to an injurious degree. But some parts of culture, such as climate, are often beyond our control; as, for example, when a very dry spring and east wind prevails, in which case many insects increase, or rather their larvae are hatched and reared under such favorable circumstances that few of them die, and all of them become strong in proportion as the plants on which they live, in consequence of the dry weather (favorable to the insects), become weak. In such a case as this, or its reverse, that of a series of cold moist weather, the agriculturist can do little or nothing.

6918. The *palliative operations* are various. Artificial bad weather will annoy every description of organized being, and especially animals. Excessive waterings, stormy application of water with a syringe, violent wind produced by shaking the plant or tree in the air instead of moving the air round the tree, as in natural wind; these and similar operations will materially injure and annoy insects, both in their common functions and in the work of generation, hatching, and rearing. Insects may be farther annoyed by throwing on them acrid waters or powders, as tobacco-water, lime-water, powdered quick-lime, soot, ashes, barley-awns, &c. The smell of tar is particularly offensive to various moths and butterflies; and it is said, if a little of it is placed under plants, or if they are watered with tar-water, these insects will not lay their eggs on them. It is also said that if shreds of flannel are hung on trees or plants, moths and butterflies will lay their eggs on the shreds, in preference to the leaves of the plants. The effect of the fumes of tobacco, sulphur, urine, &c. are well known. Saline substances mixed with water are injurious to most insects with tender skins, as the worm and slug; and hot water, where it can be applied without injuring vegetation, is equally, if not more powerfully, injurious. Water heated to 120 or 130 degrees will not injure plants whose leaves are fully expanded and in some degree hardened; and water at 200 degrees or upwards may be poured over leafless plants.

6919. The *operations for the utter removal or destruction of insects* are few, and chiefly that of hand-picking, or otherwise removing or killing by manual operations with a brush, sponge, or net. Destruction by hand-picking should, if possible, commence with the parent insect in its fly or perfect state before it has deposited its ova. Thus the gathering of moths, butterflies, and large wasps may save the gathering afterwards of thousands of caterpillars and the drowning of hundreds of wasps, as preventing weeds from seeding in a garden will soon eradicate them altogether.

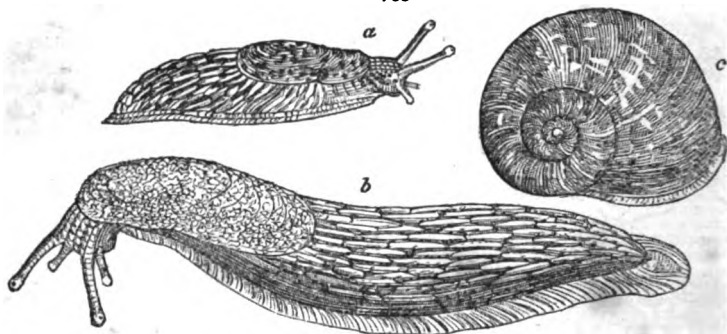
6920. *Catching the winged insect, or hand-picking the eggs, or larvae*, are the only certain modes of preventing the ravages of the gooseberry caterpillar. As soon as the eggs, which are white, and no thicker than hairs, are deposited and appear on the under side of the leaf, they should be rubbed off, or the entire leaf gathered. It is true, watering the leaves well, and then dusting them with powdered quick-lime, will destroy all those eggs which are wet at the time the lime falls on them: but will it fall on the under sides of the leaves? Watering with lime-water is better; but even that operation is less certain, more troublesome, and not much more expeditious than hand-picking taken in time. In extreme cases, both modes may be combined.

SECT. IV. Of the Worm Tribes injurious in Agriculture.

6921. Of *worms* (*Vermes*, L), there are only a few genera which are materially injurious to agriculture, viz. the earth-worm (*Lumbricus*), the slug (*Limax*), and the snail (*Helix*). The *wire-worm*, so injurious to corn sown on soils newly broken up, and also in gardens, is not a worm, but the larvae of a species of *Tipula*; commonly of *T. cræsta* and *oleracea*. (6907.)

6962. The slug (*Limax*) is without a shell, and distinguished by its lateral pore. There are sixteen British species: the *L. ater* (fig. 765 b), *alba*, and *hyalinus* are the most common in gardens; and the *L. agrestis* (a) is common both in gardens and fields, and is the species recommended to be swallowed by consumptive persons. The snail (*Helix*) is a numerous genus, and, like the slug, very destructive to plants and fruit: both snails and slugs are hermaphrodites, having both sexes united in each individual; they lay their eggs with great care in the earth, and the young ones are hatched, the slugs without shells, and the snails with shells completely formed. They are most troublesome in spring and autumn, and during mild weather in winter. In dry warm weather, and during frosts, they retire into the earth and remain there in a torpid state. The most common species is the *H. hortensis* (fig. 765 c), or garden-snail,

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of which it is remarked, that having once attacked a leaf or fruit, it will not begin on another till the first is wholly eaten. Snails, slugs, and worms, may be annoyed by caustic substances scattered over them, or by watering with bitter infusions, acids or alkalis, as vinegar, or what is equally effectual and cheaper, lime-water; but the only effectual way of getting rid of snails is by hand-picking. They may be collected under decaying leaves or haulm, laid down on purpose to attract them. In this way, as we have seen (4916.), a whole field may soon, and at little trouble and expense, be effectually cleared of this class of enemies.

PART IV.

STATISTICS OF BRITISH AGRICULTURE.

6923. After having considered agriculture as to its history, as to the scientific principles on which it is founded, and the application of these principles to the different branches of practice; it remains only to take a statistical survey and estimate of its present state and future progress in the British isles.

BOOK I.

OF THE PRESENT STATE OF AGRICULTURE IN THE BRITISH ISLES.

6924. The present state of British Agriculture, as to knowledge and the details of practice, has been the subject of the former PARTS of this work; but its importance in the general economy of society, can only be learned by a view of the manner in which it is actually carried on; the modifications to which it has given rise in the pursuits of those who have embraced the art as a source of livelihood; of the kinds of farms cultivated by different orders of agriculturists; of the principal practices of each of the different counties of Britain and Ireland as to agriculture; of the British authors who have written on the subject; and of the professional police and public laws relative to husbandmen and agriculture.

CHAP. I.

Of the different Descriptions of Men engaged in the Practice or Pursuit of Agriculture.

6925. Agriculturists may be arranged as operators or serving agriculturists; dealers or commercial agriculturists, counsellors, professors or artists; and patrons.

SECT. I. *Of Operators or serving Agriculturists.*

6926. The lowest grade in the scale of this class is *farm laborers*, who may be either men, women, or children; and either local residents, periodical visitants for particular labors, as hay-making, reaping, &c., or itinerant workmen for taking jobs, as ditching, stocking, &c. None of this class of operators are supposed to have received any other professional instruction than what they have derived casually, or from observing others.

6927. *Apprentices* are little known in agriculture; but they occur sometimes, either as the children of other operators, whose parents bind them a certain number of years, during which they are to work for their food and clothes, and 5*l.* or 10*l.* to be received at the end of the term according to conduct; or sons of richer persons, who pay a premium for the instruction to be received, and for boarding with the master. The former class of apprentices generally look forward to being ploughmen, shepherds, head ploughmen, or inferior bailiffs; the latter to being first bailiffs, stewards of estates, or to farming on their own account. Pariah boys are sometimes bound apprentices of the first class, and various noblemen's sons from almost every kingdom of Europe have been included in the second.

6928. The term *journeyman* is as little known in agriculture as apprentice. Those who answer to that term are the professional operators of a farm, such as ploughmen, cattle herds, shepherds, and hedgers. These rank decidedly above laborers of all work. A ploughman may not unaptly be considered as of the rank of an apprentice till he can *far* or set out ridges, and after he can do this as of the rank of journeyman till he can stack and sow. He may then be considered as a master of his art, entitled to work the best pair of horses, and if twenty-five or thirty years of age, to enter into the marriage state.

6929. A *hedger* is a professional operator, who may be considered as ranking with a master ploughman. His business is to plant, clean, prune, cut, lay, plash, and repair hedges; prune forest and orchard trees, and effect other operations with ligneous plants on the farm. In Berwickshire hedgers are generally very intelligent men, and keep the fences on the farms in the border counties in excellent order, and the hedge-row trees handsomely pruned.

6930. A *woodman* is an operator employed to prune trees and manage hedges, and is of the same rank and requires the same kind and degree of professional knowledge as the hedger. Generally he is more conversant with barking trees for the tanners, converting copsewood and measuring timber than the other, being more engaged with woods than hedges.

6931. A *head ploughman*, on small farms, is to be considered as the bailiff in the absence of the master. He works the best pair of horses, and assists the master in stacking and sowing. On larger farms, where a regular bailiff is kept, there is also a head ploughman, who acts as substitute for the bailiff in his temporary absence, as far as operatives and overlooking operations; but not in money matters or contracts.

6932. A *farm bailiff* is, or should be, a person of tolerable education, who understands accounts, measuring of work, land, and timber, and can draw up agreements for hiring servants. He should have practised every part of farming himself, from tending poultry, swine, and sheep, to stacking and sowing. When employed by a gentleman, or one who has no skill in farming, he should not be under twenty-five years of age; but a farmer's bailiff need not exceed twenty-one years, is to be considered as a sort of apprentice, and will be directed in all leading matters by his master.

6933. A *bailiff and gardener*, or gardener and grieve, as they are called in some places, is a sort of hybrid upper servant, who seldom excels either as a farmer or a gardener, and is only fit for situations of limited extent, and an indifferent style of performance.

6934. The *forester* or head woodman is to the woods of an estate what the bailiff is to the farm lands in hand. He directs and superintends the woodmen and their laborers, in planting, rearing, and pruning plantations, and in the felling of timber or copse, barking, charcoal making, and in short every thing connected with timber, trees, copses, or hedges.

6935. The *land steward* (*Factor*, Scotch; *Facteur*, Fr.; *Factor*, Ger. and *Fattore*, Ital.), is to a whole estate what a bailiff is to the demesne or a particular farm. His business is to control the managers of the lands in hand, as the forester, gardener, bailiff, &c.; to see that farmers fulfil the covenants of their leases; to attend to repairs, roads, public and parochial matters in behalf of the landlord, and generally to receive rents.

6936. *Under stewards*, or steward's bailiffs, as they are called, are assistants to the main steward, or have the care of detached estates, containing a few farms or woods.

6937. *Demesne stewards*, are such as are kept chiefly for regulating the affairs of demesne lands, that is, lands surrounding the mansion in hand, or of an estate of small size, where all the lands are in hand, but where an extensive establishment of horses, servants, a large garden, &c. are kept up. Here the steward performs the duties of bailiff, forester, and in some degree of house-steward, by his connection with the stables and game-keeper, and other domestic rural matters.

6938. *Court farmer*, (*Hoffmeyer*, Ger. ; *Grangero de la corte*, Span. ; *Agronome de la cour*, Fr. ; and *Fattore della corte*, Ital.), may be considered the highest step, the *summum bonum* of agricultural servitude. The late Ramsay Robinson, Esq. was bailiff to Geo. III. ; his sister, Miss Robinson, was royal dairy-woman ; and Sir Joseph Banks, royal shepherd.

Sect. II. Commercial Agriculturists.

6939. The first grade here is the *jobbing farmer*, who keeps a team, a cart, plough, pair of harrows, and probably one or two hand implements. He hires himself by the day, week, or by the acre to plough, sow, or labor the small spots of ground of tradesmen who keep a cow but no laboring stock ; or to assist farmers who are behind with their labors. The contractors for executing works devised by the agricultural engineer (6969.), though widely separated in point of wealth from the common jobber, yet belong to the same species ; both agree in selling their labor and skill in a raw state, not when manufactured into produce like the other commercial agriculturist.

6940. *Itinerant agriculturists* are of two kinds ; such as take grounds for the culture of one or two crops of particular sorts of plants, as woad, flax, &c. (5964.) ; and such as travel with a plough and pair, &c. to teach that operation to young farmers, or their servants, a practice at one time carried on in Ireland under the patronage of the Dublin Society.

6941. *Cottage farmers* are such as possess a cottage and an acre or two of land, which they may either keep in aration or pasture ; disposing of the corn, green crops, or dairy produce in various ways, according to local circumstances.

6942. *Poultry farmers*, such as devote themselves chiefly to the breeding, rearing, and fattening of poultry, and the growing of feathers and quills.

6943. *Garden farmers* are such as possess lands near large towns, or sea-ports, and grow the commoner garden vegetables, as pease, onions, cabbages, &c. for the market ; or herbs for the distillers and druggists.

6944. *Seed farmers*. Small farmers who devote themselves chiefly to the growing of garden seeds for the London seedsmen, and for the distillery. They are to be found only in a few counties in the central and southern districts of England, and chiefly in Kent and Essex. (See *Encyc. of Gard.* 2d edit. 7390.)

6945. *Orchard farmers* are such as farm grass or arable orchards, sometimes joined to hop lands and garden farms ; often with a small dairy ; with rearing of poultry, rabbits, &c., and sometimes with the breeding and training of dogs ; the latter a very lucrative branch when well understood.

6946. *Hop farmers*, such as make hops a principal article of cultivation, to which are sometimes joined garden and orchard farming.

6947. *Milk or cow farmers*, such as keep cows for selling their milk in an unmanufactured state. These farmers are of course limited to populous neighborhoods. Cow-keepers differ from cow-farmers, in having their establishments in towns, and in purchasing, not growing, their cow provender.

6948. *Dairy farmers*, such as keep cows and manufacture their milk into butter or cheese. These are most common in rich moist flat districts, as Cheshire, part of Gloucestershire, Leicestershire, &c.

6949. *Graziers*, farmers whose chief business consists in buying, feeding, and selling cattle and sheep. Their farms are chiefly in old pasture, and they are more commonly feeders than breeders. The most extensive in England are in Leicestershire and Lincolnshire.

6950. *Stock farmers*, such as devote themselves to breeding and rearing different kinds of live stock, especially horses and cattle. They are most common in Yorkshire.

6951. *Store farmers*, breeders who devote themselves chiefly to the sheep and cattle families. They are common in the border counties, in Wales, and in the Highlands.

6952. *Hay farmers* are confined to a small district round London ; where they grow chiefly natural or meadow hay for the London coach and saddle horses, and for cow-keepers.

6953. *Corn-farmers*, as opposed to hay, dairy, grazing, and breeding farmers, is a term employed to such as occupy lands more adapted for the plough than for pasturage, as arable clays and loams.

6954. *Wood-farmers*, such as rent woodlands, to be periodically cut for fuel, bark, fence-wood, charcoal, or other purposes.

6955. *Quarry-farmers*, such as rent quarries of lime or other stone, gravel-pits, clay-fields, marle-pits, &c.

6956. *Mine-farmers*, or master miners or mine-holders, such as rent coal-mines, or mines of iron, lead, or other metals.

6957. *Salmon or river-farmers*, or fishery renters, such as rent rivers or ponds for the sake of their fish.

6958. *Commercial or professional farmers*, such as farm lands for profit. Those who farm an extent of good land under one hundred acres, are considered small farmers; under three hundred acres, middling farmers; above and under five hundred acres, large farmers; and exceeding that quantity, extensive farmers: a very proper title, for few arable lands can be profitably cultivated to a greater extent in one farm or by one establishment than five hundred acres, and those which exceed that quantity, are generally breeding or other stock farms, characterised by their extent.

6959. *Gentlemen farmers*, are professional farmers on a large scale, who do not associate with their minor and personally working brethren; but who affect in their style of living the habits and manners of independent men or gentlemen. It is a character extremely liable to ridicule by the vulgar yeoman and purse-proud farmer on the one hand, and those persons who are gentlemen by profession, and men of family on the other.

6960. *Yeomen farmers*, small proprietors who farm their own lands, but yet aspire not to the manners and habits of gentlemen.

6961. *Farming landlords*, proprietors who farm their own lands on a large scale.

SECT. III. *Agricultural Counsellors, Artists, or Professors.*

6962. *The land-measurer* is the lowest grade of agricultural artists; he is very often the village schoolmaster, and is called in to measure work done by the job, as mowing, reaping, hedging, trenching, &c.

6963. *The agricultural salesman* is a person who attends at fairs, markets, &c., and acts as agent to buyers and sellers of corn and cattle. There are also salesmen purposely for hay and straw, others for green food, turnips, potatoes, &c.

6964. *The appraiser*, or valuer of farming-stock, comes next in order. This professor values the live and dead stock, and crop, tillages, manures, &c., and sometimes also the remainders of leases between outgoing and incoming tenants, or betwixt tenants and their landlords. Occasionally the appraiser is employed to value lands, but this is generally the business of the land-valuer.

6965. *The land-surveyor* generally confines his avocations to the measuring and mapping of lands; or to their subdivision, or the arrangement of fences and other lines; but sometimes he joins the business of appraiser and valuer, and even timber-measurer.

6966. *The timber surveyor and valuer*, confines himself in general to the measurement and valuation of fallen or standing timber; he also measures and estimates the value of bark, faggots, roots, charcoal, ashes, willows, hoops, and various other products of ligneous plants.

6967. *The land-valuer* not only values the rental, but the price or fee-simple of lands, buildings, woods, quarries, and waters. He does not often meddle with metallic or saline mines; but he sometimes values fisheries, stone and lime quarries, brick-earth, gravel, chalk, &c. This profession requires not only a general knowledge of agriculture in the most extensive sense of the word, but a very extensive acquaintance with the country in which the property lies, and great experience in business. There are local and general land-surveyors and land valuers: the general professors live in the capital cities or in the metropolis, and generally unite the business of land-agent.

6968. *The land-agent* may or may not be a land-valuer, but at all events he should possess the knowledge of the valuer in an eminent degree. His business is to effect the transfer of property either by purchase, sale, hiring, or letting; and also to collect rents, and often to relet farms, and effect other business belonging to the land-valuer. Land-agents are very frequently attorneys, who know little of agriculture; but who save their employers the trouble of employing both a land-steward of superior abilities, and a lawyer to draw up agreements and leases. It is the opinion of the best informed agriculturists both of Britain and France, that the employment of attorneys as land-stewards and agents, has been one of the chief causes of the retardation of agriculture throughout Europe. Chateaufieux has clearly shown how this cause has operated in France and Italy, and Dr. Anderson, Arthur Young, Marshal, and various others have deprecated its influence in Britain. The love of precedent, which these men cannot abandon from habit; the love of litigation, to which they adhere from taste and interest; and the ignorance of agriculture, from the nature of their education, are the causes that have counteracted the tendency to change and amelioration.

6969. Of *agricultural engineers* there are considerable variety. The *drainer* for laying out drains and water-works; the *irrigator*, for watering the surface of grass-lands; the *road engineer*, for laying out roads; the *mineral surveyor*, for searching for, measuring, mapping, and valuing mines and minerals; the *coal viewer*, for estimating the value of coal works; the *rural architect*, for designing and superintending the execution of agricultural buildings, and the *hydrographical and canal engineers*, for canals, harbors, mills, and the greater water-works.

6970. *The veterinary surgeon*, or agricultural doctor, is to be considered as a rural

professor; and as subordinate grades, may be enumerated the farrier, (*Ferrier*, Fr.; *Ferraio*, Ital. a smith, from *ferrum*, L. iron.), cowlcech, and castrator or gelder.

6971. *The agricultural draftsman*, or artist by way of eminence, is employed in designing and painting live-stock, implements, plants, and cultivated scenery; the plans of farms are taken by the land-surveyor, designs of buildings made by the architect, and new inventions in machinery and implements are drawn by the inventors, whether millwrights or agricultural mechanists.

6972. *The agricultural author* may be considered as the most universal kind of agricultural counsellor, since his province includes every branch of the art, and comprehends times and practices past, present, and to come. The simplest variety of this species is the author of single papers in magazines, or the transactions of societies; the most extensive, he who embraces the whole of the subject; and the most valuable, he who communicates original information.

6973. *The professor of agricultural science* (*Professeur d'Agriculture ou d'Economie Rural*, Fr.; *Hochlehrer von Ackerbau*, or *H. von Land Wirtschaft*, Ger.; *Profesor d'Agricultura*, Span.; and *Professore d'Agricoltura*, Ital.), when appointed by a permanent or national institution, may be reckoned the highest grade of agricultural counsellor: since he is not a self-constituted instructor, like the author; but constituted by competent judges as capable of instructing the public. The first public professor of agriculture appointed in Britain was Dr. Coventry of the University of Edinburgh, about 1790; and the next Sir Humphrey Davy, Lecturer on Agricultural Chemistry to the Board of Agriculture, about 1807: both highly eminent as agricultural counsellors, independently of their other merits. There are agricultural professors in Dublin and Cork. In almost every University on the continent there is an agricultural chair, and in some of the German and Russian Colleges there are chairs for gardening (*Gärtnerer*), forest-culture (*Forstwissenschaft*), and rural architecture (*Land Baukunst*).

SECT. IV. *Patrons of Agriculture.*

6974. Every man being a *consumer* of some description of agricultural produce, may be considered a promoter of the art by causing a demand for its productions. The more valuable consumers are such as live on the best bread, butcher's meat, fowls, and dairy products; and the greatest of all patrons, both of agriculture and gardening, are such as fare sumptuously every day.

6975. *Amateur agriculturists*, lovers of agriculture, promote the art by the applause they bestow on its productions; of which, to a certain extent, they become purchasers, as of farming books, prints of cattle, implements, &c.

6976. *Connoisseurs*, critical or skilful lovers of agriculture, promote the art in the same way as the amateur, but much more powerfully, in proportion as approbation founded on knowledge is valued before that which arises chiefly from spontaneous affection. By the purchase of books, models, attendance at agricultural exhibitions, &c., connoisseurs encourage both counsellors and commercial agriculturists. Sometimes, also, by their writings, of which Sir John Sinclair is an eminent example.

6977. *Employers* of agriculturists, whether of the serving class, as bailiffs, stewards, &c., or of the order of professors or artists, are obvious encouragers of the art.

6978. *Amateur farmers* are patrons on the same principle as employers; and sometimes, also, they effect improvements, or communicate valuable information to the public. Cline, the eminent surgeon, and Dr. Parry, the physician, are eminent examples.

6979. *Noblemen and proprietor farmers* are conspicuous patrons. They render the art fashionable, and by the general attention so directed, and consequent occupation of many minds on the same subject, new ideas are elicited, and dormant talents called forth and employed. Russel, Coke, Curwen, and Somerville, stand preeminent among this species of patrons, and many others might be added.

6980. *Noblemen and gentlemen improvers*, whether by planting, building, road-making, establishing villages, canals, harbors, &c. are evidently greater patrons of agriculture than noblemen farmers, since their improvements affect society more extensively. As decidedly at the head of this species of patron may be mentioned the late Duke of Bridgewater and the present Marquess of Stafford, and to these names might be added a number of others.

CHAP. II.

Of the different Kinds of Farms in Britain relatively to the different Classes of Society who are the Occupiers.

6981. *Cottage farms* form the first link in the chain of temporary terrestrial possessions. They consist of one or more acres appended to a cottage, for the purpose of enabling the occupier to keep a cow; if any part of this farm is in aration, the labor is either hired of some jobbing agriculturist, or done by spade: or two or more cottagers join together and form a team of their cows, with which, and implements borrowed from the village-carpenter or smith, they accomplish their labor.

6982. *Farms of working mechanics.* These are larger than the former, and are rented by country blacksmiths, carpenters, &c. who often keep a horse or a pair of horses. Both this and the former sort are very often injurious to the occupiers, by drawing off their attention from their principal source of income; though it must be confessed at the same time, that the idea of occupying land, and raising one's own corn, clover, milk, butter, eggs, pulse, &c. is highly gratifying; gives a sort of sense of property, and has an air of independence and liberty, highly valued by men in general.

6983. *Farms of village tradesmen and shopkeepers.* Many of these men, such as bakers, butchers, grocers, &c. keep a horse at any rate; by renting a few acres they are able to keep another, and add a cow, and other minor species of live stock. The attention required from the master forms a healthful recreation, and agreeable variety of pursuit; and if this recreation does not interfere with main pursuits, there is a gain of health and respectability.

6984. *Farms occupied with a view to profit by town and city tradesmen.* These are on a larger scale than the last, and held by stable-keepers, cow-keepers, butchers, corn-dealers, &c. They are often of considerable size, mostly under grass, and managed by bailiffs. Arable farms in such hands are rarely well managed, as every thing is made to depend on manure; but as less skill and vigilance is required in managing grass lands, hay or pasture farms of this description are generally well manured, and consequently productive. They are seldom however profitable, and it is only because the renter reaps the double profit of grower and consumer, has some enjoyment in the idea of the thing, and some increase of health from the requisite visits to it, that he finds it suitable to continue his farming operations.

6985. *Farms occupied by city tradesmen for recreative enjoyment.* These are of various descriptions, and generally managed by bailiffs. They may be considered as affording recompence by the amusement, exercise, and health which they afford, and the interest in country matters which they excite. Many a worthy man thus throws away, almost at random, on agriculture, what he has gained by trade with the greatest industry, and frugality, often joined to skill and ingenuity. When the farm promises well, the tradesman is sometimes tempted to sell his trade and turn farmer for good (as it is called, *i. e.* for a principal occupation), and often ends in impoverishing, or even ruining himself.

6986. *Farms attached to the villas and country houses of wealthy citizens.* On these the wealthy citizen plays at agriculture, aided by a skilful manager or bailiff. Immense sums of money are thus expended in the neighborhood of large towns; many ingenious practices are displayed; and though nothing in the way of profit is ever expected to be gained; yet on the whole an attention to agriculture is excited in the minds of wealthy commercialists, who buy books on the subject, procure bailiffs, approved implements and breeds of stock; and thus give encouragement to these and other productions connected with the subject. The history of farming for the last twenty years round Edinburgh, Liverpool, and London, affords some curious, singular, and extravagant examples of this description of farming, and some of a much more judicious description.

6987. *Demesne farms,* or such as are occupied by the landed proprietors of the country. These are of a great many different kinds; some regularly appended to the park; some comprising a part of the park separated by temporary fences; and others taken into occupation without regard to situation. Some proprietors take all the farms on their estate successively into their own hands, cultivate them for a few years, bring them into excellent order, and then let them to farmers. Much good is often done by proprietors occupying land themselves; new practices, and new kinds of vegetables and live stock, exhibited and disseminated; and the landlord himself being instructed by experience in the practice of farming, is better able to judge what his land should let for; and more likely to appreciate good tenants, and sympathise with the losses of his farmers in bad seasons. Add also, that a proprietor in this way procures better butcher meat of every kind than he could generally purchase in the neighboring markets; and, if he chooses, better legumes and roots, and even better cabbages and other culinary vegetables than he could grow in his kitchen garden. The bailiffs on such farms are, or ought to be, well educated men, brought up to farming in the best districts. They should be well paid, and have

sub-bailiffs under them. The establishments of Bedford, Coke, Curwen, Albemarle, &c. are among the most complete in this kind of farming.

6988. *The farms of professional farmers.* It must be obvious, that this class includes more than nine-tenths of all the farms in the country. They are of every description of soil, climate, situation, &c. which the country affords; of all manner of sizes, according to the demand created by such as follow farming as a business, and either devoted to the general purposes of corn and cattle, or more particularly for poultry, milking, dairying, garden crops, hops, orchard crops, grazing, breeding, hay, corn, wood, minerals, as stone quarries, &c., or fishes. At the origin of what we now call farming, or when the hiring of land by cultivators succeeded to cultivating them for the landlords, or in partnership with the landlords, as is still the case in Italy and most other countries, farms would of course be small, and farmers men of scarcely any capital or consideration in society. Just emancipated from a state of bondage and villanage, the new created independent tenant could not easily throw off the chains which formerly shackled his mind and prevented his energies from being brought into action, and he could have little or no property when he had no means of acquiring it but by plunder, or preserving it but by concealment. Hence the first tenants were assisted by their landlords, and one remnant of this practice, that of allowing farmers to have a year's rent always in hand; or, in other words, not to demand the rent till half or a whole year after it is due, still exists in some parts of Scotland and Ireland. In process of time, however, and from various direct and indirect causes, farmers at length acquired some degree of capital and respectability; and as they naturally thought of employing the former, of course farms began to be enlarged to afford scope, and leases granted to afford security. This practice has been going on in Britain for more than two centuries past, and receives a fresh impulse whenever the prices of grain rise high, and continue so for some time. At no period have they been so high as about the commencement of the present century, and during no period have the riches and respectability of farmers so much increased. More recent political changes, however, have proved singularly disastrous to farmers; and till the corn laws are either obliterated, or regulated on some permanent and more moderate principle, agriculture and its practitioners of every description will remain liable to the extremes of profitable occupation and ruin.

CHAP. III.

Topographical Survey of the British Isles in respect to Agriculture.

6989. The *British isles*, as we have already observed (1254.), are in their present state, naturally and politically more favorable to the practice of the agriculture of ale, butcher meat, and wheat, than any other country in the world. They have their disadvantages both in climate and in civil and political matters; but, notwithstanding, there is no country in the world where farmers or proprietors are so respectable a class of men, and where such excellent corn, herbage, roots, and hay, either raw, or in their manufactured state of bread, ale, and butcher meat, is brought to market.

6990. The following *outline of the state of agriculture in each of the different counties of the united kingdom* is taken from the *Surveys* published under the authority of the Board of Agriculture, or the Dublin Society; from Marshal's remarks on these surveys, and his other writings; and in some cases, from our own observation; having at various periods, since the year 1805, been in almost every county in Britain, and in most of those in Ireland. Agricultural improvement is often of so variable and fleeting a nature, that notwithstanding our utmost care, some things may be found here inserted as such, that no longer exist; and from the period, varying from 12 to 20 years, which has elapsed since the surveys were published, many improvements may have been made deserving of insertion which are omitted. These are unavoidable defects attendant on this part of our work; but though we cannot render it perfect, yet we are of opinion we can bring together a sufficient number of facts as to the natural and agricultural circumstances of each county, as to render it both interesting and useful to the reader.

SECT. I. *Agricultural Survey of England.*

6991. The *surface of England* is estimated at 32,150,000 acres, almost every where cultivated, and no where incapable of cultivation; in most places varied, gently and beautifully in some districts, and abruptly and on a grander scale in others. The most highly and mountainous districts are those of the north, and the most level those of the east. The most humid climates are those of the north-western counties; as Cheshire, Lancashire; and the most dry those of the south-east, as Norfolk and Suffolk. The richest grass lands are in the vales of the great rivers, as the Severn, Trent, and Thames. The richest arable lands, in Worcestershire, Warwickshire, and in part of various other counties; and the best farming, in Northumberland, Durham, and Cumberland. The greatest variety of farming may be seen in the counties round London; and the greatest

sameness, regularity, order, science, success, and the wealthiest farmers in Northumberland. The geology and minerals of the kingdom are most ably indicated in *Smith's Geological Map of England, Wales, and part of Scotland, 1815. Smith's County Geological Maps, 1819 to 1824; and Smith's Geological Table of British Organised Fossils, 1819.* These works are of the greatest importance to landed proprietors.

6992. MIDDLESEX is part of the north side of a vale watered by the Thames, and contains 179,900 acres, exhibiting a great variety of agriculture. (*Middlesex's Survey, 1806. Marshall's Review, 1818.*)

1. Geographical State and Circumstances.

Climate. Healthy; warmer near London, from the firm kept there, which consumes 800,000 chaldrons of coals annually; stationary winds from the S. W. and N. E. those from the S. W. blow 6-12ths of the year, N. E. 8-12ths. Greatest falls of rain from a few points W. of S. and are of the longer continuance when the wind has passed through the east to the south. In spring, frost in the hollows, when none on the hills, thermometer has been as high as 83°, and as low as 6° below zero.

Soil. By long continued manuring, the surface soil almost every where looks like loam. Sand and gravel on Hampstead Hill. Loamy sand from Hounslow to Colnbrook. Sandy loam on west side of the Thames, and N. E. those from the S. W. blow 6-12ths of the year, N. E. 8-12ths. Greatest falls of rain from a few points W. of S. and are of the longer continuance when the wind has passed through the east to the south. In spring, frost in the hollows, when none on the hills, thermometer has been as high as 83°, and as low as 6° below zero.

Surface. Gently waving; highest towards the north. Hampstead 400 feet above the level of the sea. One mile from London on the Kingsland Road, the surface of upwards of 1000 acres is lowered at an average five feet from the brick earth dug out, which of ordinary quality has produced 4000l. per acre; and when marly, for malms or white bricks, 20,000l. per acre. Brick earth formerly 1000l. per acre, now 500l. per acre. An acre at four feet deep, yields four millions of bricks. **Mineral strata.** 1. Cultivated surface. 2. Gravel of flints, 5 or 10 feet in thickness. 3. Lead or blue clay, 200 or 300 feet in depth. 4. Marine sediment, 3 or 4 feet in depth. 5. Loose sand, gravel, and water, the latter arising in such quantities as to prevent digging deeper.

Water. Abundant and excellent. The Thames, from Oxford to Maidenhead, falls about 24 feet in ten miles; from Maidenhead to Chertsey Bridge, 19 feet in ten miles; thence to Mortlake, 13 feet per ten miles; and to London, one foot per mile; in London the fall diminishes till it is lost in the sea. Tide flows twenty-three miles up the Thames. Spring water found at various depths, from 5 to 500 feet; the latter, the depth of Paddington.

Mineral waters at East Acton, Hampstead, and Baginbun: wells: chalybeates little used.

Fish caught in the Thames. Sturgeon, salmon, tench, barbel, roach, dace, chub, bream, gudgeon, ruffe, bleak, eels, smelts, and flounders.

2. State of Property.

Religion and their management. Generally under the care of stewards, and badly managed.

Tenants. Much freehold, considerable extent of copyhold, some church, college, and corporation land.

3. Buildings.

Houses of proprietors. Numerous, splendid, commodious.

Farm-houses, offices, repairs. Oldest built with timber lathed and plastered, roofs thatched; erected piecemeal; situated in villages, sides of lanes, and near large ponds. Those built within the present century of brick, and covered with tiles. Farmery of Sutton Court, Chiswick, Wickham, and Isleworth, models of their kind. Very few buildings required on hay farms.

Cottages, brick and tiled, and generally in villages; formerly with right of common, now done away by enclosures.

4. Mode of Cultivation.

Size of farms. Generally small compared with other counties; three cow-farms near town, from 500 to 600 acres each, rented at from 2 to 5000l. Many of 300l.; a average of county 100l.

Character of the farmers. Four classes. 1. Cow keepers, gardeners, and nurserymen. 2. A few small farmers of fortune.

3. Amateur farmers, who have left other pursuits. 4. Commercial or professional farmers, equal in number to half the others.

Rural artificers. Bad; impossible to get any agricultural implement or machine made on a good principle by the country artificers; but able mechanics in London; Macdonald, Cook, Soarwood, and especially Weir, a Northumberland man, and practically acquainted with agriculture.

Grain paid in money, sometimes a small part in butter and cream at fixed prices. Varies from 10s. to 10l. per acre, or higher for nurseries.

Tithes in many places taken in kind, in some compounded for annually, or for a fixed period.

Poor, and the rates for their relief, average 3s. 6d. per acre. Leases, and the rates for their relief, average 3s. 6d. per acre. Leases, and the rates for their relief, average 3s. 6d. per acre. Leases, and the rates for their relief, average 3s. 6d. per acre.

Expenses and profit. Expenses on entering a farm, greater than in distant places: profits seldom more than a mere subsistence to the farmer.

5. Implements.

All bad; plough barbarous; threshing mills rare.

6. Enclosures.

Now mostly enclosed. Nineteen commons enclosed from 1800 to 1806, containing 20,000 acres and upwards. Old fences of a mixture of white and black thorn, maple, hazel, briar crab, damson-plum, &c.; new of white thorn with ditch

and bank; gates mostly five-barred, and of oak; enclosures too numerous.

7. Arable Land.

About 14,000 acres, wretchedly managed, ploughed with teams of three or four horses; rotation generally fallow, wheat, beans.

8. Grass Lands.

Meadows better managed; hay-making good.

9. Gardens and Orchards.

From Kensington through Hammersmith, Chiswick, Brentford, Isleworth, and Twickenham, seven miles of garden ground; may be denominated the great London fruit garden, north of the Thames. An upper and under crop taken at the same time; the upper the fruits on trees; the under strawberries and various herbaceous crops. To increase shelter and warmth in autumn, they raise banks of soil 3 feet high, facing the south, and sloped to an angle of 45°; on these they plant the endive in September, and near the bottom, from October to Christmas, they drill a row of peas; the endive is preserved from rotting, and the peas come to maturity nearly as early as if under a wall. The springs here, lie eight or ten feet under the surface, and the water is raised from the wells by a bucket and lever, balanced by a stone. (fig. 157.) Three thousand acres of garden ground here, employing five persons, a man, his wife, and three children, per acre, during the winter half-year, and during summer five persons more, chiefly Welsh women. Estimated produce 1000l. per acre.

Kitchen gardens. Much fresh litter dug required for growing mushrooms, early cucumbers, salads, potatoes, asparagus, &c. Consumption of the metropolis and its environs, for fruits and vegetables, estimated at upwards of a million sterling per annum. Several farming gardens pay 10000l. per annum.

Nursery grounds. About 1500 acres, producing 75,0000l. a year.

10. Woods and Plantations.

Coppes and woods decreasing for ages: still a few acres near Hampstead and Highgate.

Hedge-row timber much disguised by being pollarded or pruned to may-poles.

Willows or osiers. Many islets on the Thames, rented by boat and planted with osiers, and sold as borders of the river so planted. Species *salix vitellina*, *amygdaloides*, or almond-leaved, and *vitellina*, or osier; willows when cut, made up in bundles, or boulds, forty-two inches round, at sixteen inches above the but-ends.

11. Improvements.

Drainage to carry off surface water. The mode of making surface gutters on meadows by means of an addition to cart wheels, (3979.) Invented by the reporter.

Manure produced in London by 30,000 horses, 8000 cows, and 700,000 Christians, equals 500,000 loads; of which, half is carried into the Thames by the sewers, including ninety-nine per cent. of the night soil.

12. Live Stock.

Less live stock on the farms of this county than in any other: no breeding. Short horned cows of Holderness chiefly used by milkmen: number kept 8500; average produce nine quarts per day; fed on hay, turnips, brewer's grains, linseed cake and jelly, and grass: adulterate adulterate milk, preferring dirty water to clean; and adulterate the cream by adding molasses and a little salt. Very little butter made in the county. Brewer's drays supplied with horses from the Berkshire farmers, who buy them young from Northamptonshire, and work them two or three years before they sell them. Not more than one dove house in the county; but many pigeons kept in empty wine pipes set upon posts, fifteen or twenty feet high, and many kept by journeyman tradesmen, plover fanciers in the poorer parts of London, and most other towns and villages of the county.

13. Rural Economy.

Half the manual labor done by the job; laborers ruined in morals and constitution, by the public houses. Gentlemen's servants a bad and contaminating set.

14. Political Economy.

Highways of the parishes good, turnpike roads bad, beginning now (1829) to be improved to several canals terminate in or near London; and New River for supplying water; falls on the decline. Uxbridge the greatest corn market next to Mark Lane. Great cattle markets, Hounslow and Smithfield. Commerce great. Manufacturers not many; considering agriculture as a manufacture, and the soil as the raw material, and worth 15s. per acre, at an average of England; it is increased in value to 54. or 55s. per cent. Distilleries and breweries numerous.

15. Obstacles to Improvement.

Tithes, land-agents being attorneys, bad leases, bad rural artificers, &c., to be the chief obstructions.

16. Miscellaneous Observations.

Society of Arts, Veterinary College, excellent institutions. Fines called heriots should be removed; weights and measures regulated; much damage is done by game.

17. Means of Improvement.

Ample in the metropolis; want of intelligence, the great drawback.

6993. SURREY. A surface of 519,040 acres beautifully varied: poor and heathy in the west, chalky in the east, and clayey in the south. The field cultivation of clover and turnips appears to have first taken place in this county. (*Stevenson's Survey, 1813. Malcolm's Survey, 1809. Marshall's Review, 1818. Smith's Geological Map, 1821.*)

1. Geographical State and Circumstances.

Climate. Healthy winds S. W. and W. in autumn; showers from any point between N. W. and N. E. for any time. East winds

in spring, and then weather cold, raw, and drizzling. Most rain falls when the wind is S. W. or S. E.

Soils. Various and most irregularly distributed; a broad zone of tenacious, clay bordering Sussex; patches of brick

earth at Welworth, Sutton, and Stoke. Considerable extent of chalk hills from Cropton to Nutfield, and thence narrowing to the western extremity of the county. A good deal of black rich land interspersed among all the soils.

Surface. St. Anne's Hill, Cooper's Hill, and Richmond Hill celebrated. Leith Hill the highest, commands a prospect of from thirty to forty miles on every side.

Minerals. Iron ore, fuller's earth, firestone, limestone and chalk. Iron-works on the decline, on account of the dearthness of fuel. Abundance of fuller's earth in the southern part of the county, which has been dug since the beginning of the eighteenth century. Excellent firestone: when first quarried soft; kept under cover a few months becomes compact, and able to endure the action of a common fire. Owing to this stone, Dawson, proprietor of the Vauxhall plate glass works, can make plates of such a size as to surprise the French, from whom he discovered the art of plate glass making in the disguise of a common laborer. Excellent limestone at Dorking, which hardens under water; contains a little flint. Chalk used chiefly as a manure. The sand about Ryegate, the finest in the kingdom, and considerable demand for egg and hour glasses, writing-and-boxes, &c. At No such, there is a bed of brick earth, from which fire bricks and crucibles are made.

Water. Scarce in many places, particularly on the chalk. Several supplies procured from London, by boring down from one hundred to three hundred feet to the chalk stratum, where the water is excellent, soft, and abundant.

Fish ponds common on the heaths, at the western side of the county; have been used for upwards of two centuries for breeding and rearing carp and eels. One of the largest, containing one hundred and fifty acres, is near Herham.

Mineral waters numerous. Epsom water is impregnated with sulphate of magnesia, and purgative. Epsom salts originally made there, now chiefly from common salt water at Lynton in Warwickshire. The other springs are more or less impregnated with sulphate of magnesia, carbonate of lime, and iron.

2. State of Property.

No large estates: largest 10,000*l.* a year. Yeomanry not numerous; but numerous gentlemen and Gildoford farm their own estates of from 200*l.* to 400*l.* per annum. Estates mostly managed by attorneys; so far proper as to law terms, but as absurd as to agricultural restrictions, as it would be to employ a farmer to draw up the covenants and technical language, still with him being a sedate, industrious, free from prejudice, and intelligent, no covenants, or care of attorneys and stewards, will prevent him from injuring himself and his landlord by bad husbandry. When he becomes active, &c. he will take care of the landlord's interest for the sake of his own, and thus stop to facing the farmer to become active and intelligent is to leave him to the exertions of his own mind. Tenures chiefly freehold.

3. Buildings.

Few counties that can vie with Surrey in the number and elegance of its country seats. (*Esq. of Garden, Surrey.*) Possesses a great advantage over the north and east of Middlesex and Essex, in this respect, as the prevalence of the N.W. winds drives away the smoke of London. Proprietors generally reside on their estates, and eagerly introduce improvements.

Farm-houses and offices. Rainous and mean in the weald, or clayey district bordering on Sussex; better in other places. Oldest of brick covered with slate, stone, or brick nogging and tiles; situations seldom central or convenient to the farm, in villages. Stables not divided into stalls. Cow-houses near London, near London, near London, convenient, and picturesque; with a porch, a flower plat and vine in front.

Drinking ponds. Great attention paid to these on the Surrey hills; generally a first pond, where the water deposits its grossest dirt and mud before it enters the second.

4. Occupation.

Farms of all sizes, but mostly small, forty and fifty acres to three hundred. Largest farm between Guildford and Farnham is Wanborough; it contains 1,600 acres; formerly occupied by Morris Birkbeck, and now by his son. Average here one hundred and seventy acres to the tenant farmer, by which the public is unquestionably benefited, certainly by the saving of labor, and, in all probability, by the superior cultivation and increased produce. The driven out farmer may generally support or enrich himself equally well though in a different line of life. "But in every country, in all situations and circumstances, and in our own country, particularly in the situation in which it is now placed, it is of the highest importance to consider, whether a mere increase of wealth may not be purchased too dearly; whether it is prudent or wise to diminish the number of those whose souls are in hilt to their native land, by stronger ties than are known to the mere manufacturer. To the patriot, it can be little satisfaction to see his country the richest in the world, if the measures and causes which make it rich, diminish, in the most trifling degree, its independence; either by raising any passion above the love of our country, or by diminishing the number of those who must be its most natural and powerful defenders. To the moralist it can afford little pleasure to be told, that by the saving of agricultural labor, the manufactures of his country will be extended or increased, if he perceives that by the change of employment the health and virtue of part of the community are sacrificed." (*Stevenson.*)

Farmers. Old class about the clayey wealds, equal enemies to improvements in agriculture, and relaxations in morals: have no idea of educating their sons, and so little of the spirit of commerce, that they prefer selling their grain to an old customer at a lower price than taking a higher from a new one. Go to market in round frocks, the dress of their forefathers, and shy and jealous to strangers. Nearer town the farmers are more on a level with the age; but either unable or unwilling to communicate information; some exceptions of liberal, enlightened, and communicative men. Many tradesmen have turned farmers, and occupy lands near town.

Rent low. The rigidly exacted, poor's rates, and other outgoings high.

Leases general, for fourteen or twenty-one years, or on three lives.

5. Implements.

Great variety of ploughs, swing ploughs, the Scotch swing

plough used only in two places; had effect of so many different sorts of ploughs on the servants. The cultivator used by Birkbeck, and highly approved of;—with six horses, goes over eight acres in a day. Leister's friction threshing machine introduced in a few places, and found to succeed; but it threshed very slowly, and has slowly, and has slowly, and has slowly, but that of not breaking the straw of wheat. This advantage is too trifling ever to render it general. Very few winnowing machines. Sowing troughs in use, the advantage of which is, that the sower fills it himself, instead of having a woman, tilling, brought to the ground, and sowing. Best machines also in use, in one or two instances. (1764*l.*)

6. Arable Land.

Proportion considerable, tillage bad. Drilling, though introduced by Duket, of Esher, and strongly recommended, is confined to a few adjoining parishes, where the soil is light. Following on clays general, but most imperfectly executed. Rotations generally good.

Turnips, supposed to have been grown in Surrey as long or longer than in any county in England. Sir R. Weston, of Sutton, having described the Flanders culture in 1645, and as he addressed his book to his sons, it is thought they would attempt culture. Very badly cultivated at present, and seldom in raised drills. The Siberian turnip has been tried; it is a variety between the cabbage and turnip, but with a root inferior in point of size and flavor to the latter, and a branchy loose top: it does not seem adapted for field culture, though it is a novelty it is deserving trial and attention. Carrots answer well on the sandy soils. Potatoe tops sometimes given to cows, cut when in flower; a bad plan with a view to the tubers. Clover introduced by Sir R. Weston at the same time as turnips. Saintfoin succeeds well on calcareous soils, producing crops for eight years. In forming a new road through a field of saintfoin, between Cropton and Godstone, the roots were found to have penetrated several yards below the surface. The culture of hops, brought from Suffolk to Farnham about A.D. 1600; prefer a calcareous sub-soil, occupy 80*l.* per acre. Farnham is esteemed more than others, because picked earlier, and hence more delicate, and better sorted. Peppermint, lavender, wormwood, camomile, liquorice, and poppy, grown near Richam; and more extensively than in any other county. One hundred acres of peppermint, Elecampane, thubarb, soapwort, coltsfoot, vervain, angelica, rosemary, the damask and red roses, hyssop, horehound, marsh mallow, pennyroyal, and several acres of daisies, wall-flowers, sweet-williams, primroses, violets, pinks, bachelors-buttons, and the like, are also grown for Covent Garden market, where they are carried, either as entire plants in flower with balls for planting in town, flower-pots or in pots, or the flowers are gathered and sold for nosegays. Weld is grown in a few places.

7. Grass Land.

But in small proportion to the rest; most pasture in the weald, burning and sowing by Birkbeck as the best first step of breaking up old grass lands.

8. Gardens and Orchards.

Asparagus grown in great quantities at Mortlake, East Sheen, and Hattersea. Radish and other seeds also grown extensively at Hattersea. Onions for seed at Mortlake and Barnes; though chiefly at Deptford. Three thousand five hundred acres of Surrey employed in raising vegetables for the London market. Orchards attached to many of the farms, sufficient to supply from four to twelve hogheads of cider. Generally in a very bad state of cultivation; trees covered with moss; many walnuts grown at Northfleet, and at some other places; produce 30 to 50 bushels per tree.

9. Woods and Plantations.

The wold formerly a wood: some copse there still; hoops grown; charcoal for gunpowder made from hazel, dogwood, &c. common charcoal, horn-poles and faggots. Box Hill, formerly called Whitehill, by tradition, originally cultivated, till the Earl of Arundel, in the reign of Charles I. brought box trees from Kent, and planted there. Many with good reason think it not planted, but aboriginal. Soil of the hill pale loam or chalk; timber now all cut; brought only five pounds per ten. Many fir trees on chalk hill; at Crohurst, one fifty feet high and thirty-six in circumference. Broads made from the ware or spray of birch to a great extent. Fine limes at Beckwith. Osier holt or grounds about Chertsey and Byfleet, brought the same rent one hundred and fifty years ago which they do now. Furze grown for the burning of bricks; sown both broadcast, and in drills; cut every three years, and bound like corn, then stacked.

10. Heaths, Commons, and Common Fields.

Extensive heaths on south-west; surface flat, soil black sand, and gravel. A number of commons, and great extent of common fields.

11. Improvements.

Draining, paring, and burning. Manuring with London manure of a great variety of kinds.

12. Live Stock.

Very inconsiderable; only six hundred and nineteen cows kept for supplying London with milk.

Duket of Esher used to refer us to a great extent of many cattle fed by the distillers and starch manufacturers. Adam of Mount Noel, one of the architects of that name, has constructed extensive buildings for cattle, and stall-feeding six hundred at a time. Sheep kept in considerable numbers on the chalk hills and wealds. Birkbeck has been very successful in cross-breeding with merinos, that is, with the Ryeland merino of Dr. Parry, and the South Down. Immense number of pigs fed at the distilleries, and of geese kept on the wealds. Dorking hens are well known. (1683*l.*) A large warren near Banstead Downs, already described (1613*l.*)

13. Rural Economy.

Hands scarce; servants untaught; prejudiced, like many of their masters, against all new practices.

14. Political Economy.

Bad roads, though flints and other good materials abound in many places. An iron railway between Wandsworth and Weybridge for general use; the first in the kingdom of that kind, the rest being confined to the carriage of goods, and belonging to individuals; this open to all who choose to employ the waggon; as a canal is open to all who choose to employ the boat. Though on a level, and admitting of carriages both ways, yet not found to pay. The first canal lock in England were erected on the Wey. Sir R. Weston, of Sutton, brought the

confinement from Holland, and under his direction, the *Wey* was rendered navigable from Gailford to Weybridge, about 1690. Numerous fairs, several flour, paper, and oil mills. An extensive iron work at Garratone near Wandie; a mill for

staves at Steke; a distillery at Mervale. A horizontal air mill of a new construction at Besteren bridge; several distillers, brewers, and starch manufactories. Poor, numerous and degraded. Poor's rates enormous.

6994. SUSSEX. A maritime county of upwards of 900,000 acres; distinguished by chalk hills and extensive wealds, a rich soil, but little excellence or variety of agriculture; excels in South Down sheep. (*A. Young's Sussex*, 1809. *Marshal's Review*, 1818. *Smith's Geological Map*, 1819.)

1. Geographical State and Circumstances.

Climate. Warm in western parts, bleak on South Down hills; westerly gales violent, unroof stalks, hedges injured by the spray of the sea.

Soil. Chalk nearly the universal soil of the South Down hills; clay of the wealds, which constitutes more than half the surface of the county. Rich land about Chichester, and sand and gravel in a few places.

Surfaces. Mostly hilly, most so where the soil is chalk. No high hills.

Minerals. Sussex or Petworth marble used by the stonemasons, but not generally. Limestone, ironstone, sandstone, chalk, marl, and fuller's earth.

2. State of Property.

Largest estate 7500*l.* a year. Most proprietors hold land in their own occupation, and pay great attention to its culture, as E. of Egremont, D. of Richmond, E. of Chichester, Lord Sheffield.

3. Buildings.

Noblemen's seats splendid, of stone; farm-buildings generally of stone; on the South Downs built of flints; houses very generally faced with tiles, which keeps the walls dry. Cows generally stacked on circular stone piers, which prevent vermin. Sheep-yards or permanent folds walled round, and furnished with sheds and hay-racks, have been built by Ellman and some other eminent sheep farmers on the Downs. Large wooden barns. Cottages of stone, and on the Downs of flint, and more comfortable than in many parts of England. Magnificent semicircular piggery, erected by E. of Egremont at Petworth.

4. Mode of Occupation.

The most extensive farms on dry soils. Average of the wealds 100 acres. Size on the Downs 1800 to 2000 acres. Tithe taken in kind in many places, in others compounded for. Poor rates high.

5. Implements.

Plough with two wheels, large and singularly clumsy. The Rotherham plough introduced, and deemed a real improvement. Several excellent new implements introduced by the noblemen already mentioned.

6. Enclosing.

County enclosed from earliest antiquity; fields small; hedges very irregular and low. White thorn fences at Gillingham, by the Duke of Richmond, trained in a masterly manner; being like walls, or rather hogged mazes, of verdure rising from the earth.

7. Arable Land.

Tillage bad, three or four horses to a plough with a holder and driver; plough from one half to three quarters of an acre a day, following general on the stiff soils. Rotation bad, barley often follows wheat. Wheat trod in on the sandy lands; threshed by flail, and generally cleaned with a shovel and broom; one or two threshing and winnowing machines. Oats a great deal cultivated on the wealds. Pease much cultivated on the South Downs. Hops much cultivated on the eastern part of the county; but not found profitable. Rhubarb, and the poppy for opium cultivated by E. of Egremont. The roots of the rhubarb, after growing seven or eight years, are taken up, washed, dried in the sun, and then cut in slices and dried on the hot-house flues (324). Incisions are made in the poppy heads, and the exuded juice, when dry, scraped off into an earthen vessel, dried in the sun, and preserved for use. Incisions are made as long as milk flows. André, the domestic surgeon, uses the home-grown rhubarb and opium, and no other. Saintfoin is the chief hay on the eastern part of the county near Eastbourne and Brighton. Lord Egremont tried 100 acres of chicory, and found it support much stock, though on a poor soil.

8. Grass Land.

Badly managed; overrun with rubbish. One person tried hay oiled when stacking; he oiled every layer, with a watering pen and rose, lightly with linseed oil; the hay came out moist and clammy; and poultry, beasts, and sheep were fond of it, but it was deemed too hot for horses. Salt sprinkled on hay when a little damaged found a great advantage; it is done in stacking.

9. Orchards.

Some considerable orchards, and cider made. One or two

fig orchards at Tarring, near Worthing. (See *Engr. of Gard. Sussex*.)

10. Woods and Plantations, 175,000 acres.

County celebrated from the remotest antiquity for the growth of its timber, especially oak. County at the conquest one continued forest, which extended from Hampshire to Kent. Underwoods cut at twelve years, for hoops and top-logs. Ash the most profitable underwood. Finest oak-timber at Petworth.

11. Wastes.

Of considerable extent to the north of the county. Some hundreds of acres improved by E. of Egremont answer well.

12. Improvements.

E. of Egremont sent for Elkington to find water to fill a lake. E. undertook to do so, but all his trials and predictions of the effect of certain borings and open cuts which he caused to be made, proved abortive and false: no water was found. Failed in three remarkable instances at Petworth, where he drained a meadow very well. Lord Egremont considers him as not a scientific drainer, but a very good common drainer, and nothing more.

13. Live Stock.

Cattle and sheep among the best in the kingdom; cattle red; little dairying; general breeding and feeding. Oxen worked extensively by E. of Egremont and Lord Sheffield; broken to the yoke at two years and a half; yokes five feet long used and preferred by Lord Egremont. Lord Sheffield harnesses the same as for horses; twelve oxen and nine horses required to work 20 acres in tillage. For hoven cattle one quart of linseed oil given, which vomits directly, and never fails in giving relief. South Down sheep celebrated. Ellman the first breeder both of cows and sheep; breeds from the same race. New Leicester and Spanish breeds introduced to the county by Lord Sheffield. Rabbits abound and flourish every where, and are the nuisance of the county. Fowls fattened to great perfection at North Chapel and Kinsford; food, oats ground, hog's grease, sugar, pot liquor, and milk, all mixed; or oats, treacle, and suet; also sheep's plucks; they are kept very warm, and crammed morning and night; put into the coops two or three days before they begin to cram them, which is done for a fortnight, when they weigh 7 or 8 lbs. each, and are sold to the higgles: average weight 5 lbs., but some weigh double. One of Lord Egremont's tenants crams 200 fowls a year; many reported fed in this manner; great art requisite in cramming them, and numbers die in the operation. The Dorking or Darking fowls extensively raised in the wealds of Sussex; Horsham principal market for them.

The fish-ponds on the weald are innumerable; carp the chief; but tench, perch, eels, and pike are raised. A stream should always flow through the pond, and a marly soil is best. Carp fed with pease in marl-pits have weighed 25 lb. per brace. Carp kept five years before selling; then twelve to fifteen inches long; 100 stores, or one year old carp will stock an acre. At one year the carp are three inches long; at two years old seven; at three, eleven or twelve inches; at four, fourteen or fifteen; and then they breed. Lord Egremont has breeding and feeding ponds; fishes them every three years.

14. Rural Economy.

Labour high, as smuggling attracts away many young men.

15. Political Economy.

Roads bad on the clayey districts, good on the chalk. Rother river rendered navigable at Lord Egremont's expense. Fairs numerous. Manufactures of iron, charcoal, gunpowder, paper, bricks, and potash. Large court of poor-houses at Eastbourne, of which a plan and elevation is given in the "Report." In 1772 a society was established at Lewes for the encouragement of agriculture, manufacture, and industry, by John Baker Holroyd, Esq. now Lord Sheffield, and premiums offered; but on the breaking out of the war in 1778, it was dropped. In 1797 Lord Egremont established a society at Lewes for large premiums. This society still exists. The patriotic and charitable exertions of E. Egremont are most extensive. He gives away to proper objects immense quantities of clothes; food twice a week; feeds all the laboring classes at Christmas, and keeps a surgeon, apothecary's shop, and midwife's entirely at their service: they are also inoculated, and instructed gratis, &c.

6995. KENT (*Cant or Angle*) forms the south-east corner of the kingdom, and extends over 935,600 acres.

It is diversified by chalky eminences in some places, low marshy grounds on the Thames and part of the sea-coast, and an inland flat and woody tract bordering on Sussex, called the Weald, or wood (Saxon). It is one of the oldest cultivated counties in England; it was noted even by Julius Cæsar, as "the civilised place of all this Isle, and full of riches." Viewed from the great road from Dover to London, it has, with the exception of the Downs near Dover, a more garden like appearance than any county in Britain. Its agriculture is various, and it is celebrated for the culture of hops, fruits, barley, and various garden crops. (*Boys' Kent*, 1796. *Marshal's Review*, 1818. *Smith's Geological Map*, 1819.)

1. Geographical State and Circumstances.

Climate. Subject to cold winds; the prevailing are the N.E. and S.W.; former in winter attended by severe frosts, twelve inches of ice, and the destruction of crops. Milder in S.W. part of the county. In Sheppey and Thanet an early harvest, commences July 30, on the hills 1st August.

Soil. That of Thanet rich on rock chalk; of East Kent very various; chalk, loam, strong loam, hazel mould, stiff clay, flint, gravel, sand. Isle of Sheppey strong stiff clay; West Kent very various; but chalk and loam on chalk rock prevails; Weald chiefly clay, but mould, sand, and gravel in a few places. Romney Marsh sediment of the sea; a soft loam and clay.

Surfaces. Gently varied hills of chalk; Downs not so high as those of Sussex.

Minerals. Numerous chalybeate springs, at Tunbridge Wells the chief.

2. State of Property

Much divided; number of yeomanry on the increase; 9000 freeholds, and a good deal of church and college lands; socage and gavelkind tenures prevalent.

3. Buildings.

Twenty or thirty noblemen's seats, and many seats of gentlemen and citizens, merchants, bankers, &c.; few modern built fine houses; old ones of great size, entire, and ill contrived; thatched; now improving considerably. Cottages are in general comfortable, built with bricks and tiles.

4. Mode of Occupation.

Size of farms greatest on poor lands; many farms from ten

to fourteen acres each, few exceed 200 acres, some 600 to 1500 acres. Thistles and many pests collected in kind. Loams for English years most common. Many choice leasns on three lives, some on twenty-one years, renewable.

5. Implements.

Kentish turnwrest plough almost the only one known in the county, drawn by four horses in heavy, and three in light soils. Corn rakes in use after mown corn. Stubble rakes to drag stubble together; first threshing machine erected at Betchanger by the reporter.

6. Enclosing.

No common field lands but several commons; fences old and broad, belts of copse more frequent than thorn hedges. Water fences eight to fourteen feet wide, and from three to five feet deep in the marsh lands; post and rail fences prevalent in Romney Marsh. Neither fences, drains, or water furrows wanted in Thanet, where corn is grown, and often for years in succession without manure.

7. Arable Lands.

Plough for all crops from five to seven inches deep. Fallows always made on poor lands. Rotations good. Pease of various kinds for podding are sown from the middle of February to the end of March. Leadman's dwarf and the early grey thought the most prolific. Canary seed and radish seed much cultivated in Thanet and East Kent for the London seedmen. Radish seed sown in March, and crop seldom fit to reap before October, and is sometimes out on the fields at Christmas without receiving any injury from wet weather; requires much rain to rot the pods that may thresh; will produce from eight to twenty-four bushels per acre. Spinach sown in March in Thanet; when in blossom the plants (being a diocious plant) are pulled and given to pigs with advantage. Crop threshed on the field; produce, two to five quarters per acre. Kidney beans much cultivated at Sandwich and in Thanet for the London seedmen; plant from five to ten gallons per acre in between the 8th and 20th of May; if earlier in danger of frost; pulled up by roots from August to October, tied up in bunches and hung on poles to ripen; produce, ten to twenty bushels per acre. Cress and white mustard sown at the rate of two or three gallons per acre in March; reaped in July and threshed in the seed; produce eight to twenty bushels per acre. Wild sown among beans at the last hoeing in the beginning of July; ten or twelve lbs. of seed per acre; pulled when in bloom, which happens the second year, in July, and tied in single handfuls to dry; when dry bound in bundles, weighing thirty lbs. Sixty of these a load; produce from one-half to one and a half bushels per acre. Sometimes remains in stooks or barns for several years for want of a market; at other times 21s. per load; generally bought by speculating merchants, who supply the dyers with it as opportunity offers. Madder formerly much cultivated in the eastern part of the county, now given up; first cultivated on a large scale near Faversham.

8. Grass.

Hay chiefly produced in the marshes and the weald; pastures for dairying on every farm; but no dairy farms of any extent in the county; lands in Kent seldom changed from grass to arable, or the contrary. Hay-making badly conducted in most parts of the county, owing to the scarcity of hands. In Thanet and East Kent lean sheep and cattle brought in and put on the marshes and meadows till fit for the butcher.

9. Gardens and Orchards.

Near all the great towns a considerable portion of land devoted to the cultivation of vegetables; at Deptford and Gravesend are whole fields of asparagus, onions, cauliflowers, &c.; at Maidstone many fields of from one to ten acres of fruit trees; apples, cherries, and filberts raised among hops, the culture of which causes the former to grow with great luxuriance; common practice to plant 800 hop hills, 200 filberts and forty apple and cherry trees per acre the hops stand twelve, filberts thirty, and the apples and cherries in unknown length of time. Sometimes apples and cherries in alternate rows with two rows of filberts between; filberts also raised among hops without any other trees; trees planted in holes two feet square

and two splits deep; pieces of rock taken out; trees stalked and their stems brushed over with lime and night soil, which is said to make them grow exceedingly. The golden reinet apple and black heart cherries, when a few years planted, found to grow and die; yet many old trees in full vigor; cherries do best with land laid down to grass; filberts answer on few soils; best cider-maker Stone of Maidstone mixes all sorts of apples; golden pippin makes good cider alone; no occasion to watch the fermentation of cider in order to rack it off at any particular time, as alleged in Herefordshire; eating apples sent to London by the hoys, and to the north of England by the coal vessels. Fruit orchards considered the most valuable estates.

Tithe on fruit 2s. per pound on sales. Cherries require a deep soil, and bear well for thirty years; filberts a stony, sheltered sandy loam, rather inferior; they will not bear in light soil; principal hop grounds about Canterbury and Maidstone, on deep rich loam with a subsoil of loamy brick earth; produce two to fourteen or fifteen cwt. per acre; average seven cwt.

10. Woods and Plantations.

Principal produce hop-poles, fuel, husbandry wood, and some little for the dock yards; few artificial plantations.

11. Improvements.

Open drains made between flat ridges by deepening the furrows; turf and brushwood drains in use; chalk will answer when below the reach of frost; sea beach and refuse bricks also used. Several windmills which drive pumps to drain the water from marshlands. Some bogs drained under the direction of E. Kingston, and now good meadows. Several thousand loads are sometimes thrown ashore by one tide and washed away by the next; generally mixed with some yard-dung, which it helps to rot; sand spread on stiff soils without being of any use; powdered kelp sown at the rate of twenty cwt. per acre on pasture, salted, and clover sown, without any perceptible benefit; weeding a general practice; country long noted for its clean crops of corn. Thistles in grass lands mown while in bloom never come up again. Some land in Thanet recently embanked from the sea; bank thirty-six feet at base, nine feet high, and three wide at top; level of outside angle twenty-two, of inner eleven feet. Borders of the Medway below Rochester offer great scope for embanking and perhaps warping.

12. Live Stock.

Neither a dairying nor grazing county; little attention paid to the breed of cattle. Romney Marsh breed of sheep remarkable for fattening early. Fine teams of heavy horses kept at a great expense. A few rabbit warrens; the rabbits within these few years affected with the rot. Formerly many pigeons, now few; few poultry but for home consumption; few bees.

13. Rural Economy.

Labor generally done by job-servants, scarce, dear, and saucy.

14. Political Economy.

Roads generally good, formed of chalk and flints; or lime-stone and gravel; roads in the weald very bad for want of materials. As clay is there abundant, if duty taken off bricks they might be burned on the spot and the roads paved; No canal, but a water one mile long and nine feet wide. No quays, but one near Gravesend; fair and weekly markets very numerous. Agricultural commerce of county consists chiefly in exporting corn to London markets. Manufactures trifling. At Dover and Maidstone paper mills; at the Isle of Grain calico works, in the Weald iron works, and at Whitstable and Deptford copper works. Gunpowder made at Deptford. Fish-bam, calicoes printed, and linens whited, at Crayford. Poor well taken care of, earn from forty to sixty pounds per annum by hop picking and other rural employments for their wives and children.

15. Miscellaneous Observations.

Kent Agricultural Society, established at Canterbury in 1795 by Sir E. Knatchbull and P. Honeyman, Esq. Some potatoes dried on an oat kiln were found to retain their properties during long voyages, as attested by letters from the victualling office.

ESSEX. 1,240,000 acres of marshy grass-lands near the Thames, and the rest arable lands of a mixed culture, chiefly of corn and herbage. It is an old cultivated county; contains many small gardens and seed-farms near the towns, and is one of the few districts in the south-east of England where the plough is drawn by only two horses. (*Young's Survey*, 1810. *Marshall's Review*, 1818. *Smith's Geological Map*, 1830.)

1. Geographical State and Circumstances.

Climate mild; north and east the prevailing winds, which bring blights to plants, and cold and hoar-frosts to animals; ages general both in the high and low lands.

Soil almost every where a loam, and more generally heavy than light. Generally well adapted for grass or corn.

Surfacer beautiful about Hawering (Hare a ring) from Romford to Lord St. Vincent's; and from the coast, both the seats on the Stour; also very fine from Sharnbury to Harwich.

Water abundant, in rivers, creeks, and springs.

2. State of Property.

Estates vary much in size from 5s. to 20,000s. a year: in no county a greater population of small and moderate sized farms occupied by their owners. Managers of large estates sometimes attorneys, capital farmers, or private gentlemen. Farmers of all sorts of land held by leases for 21 years, both free and villein, sometimes on eight, ten, or twenty-one years' lease. Some of the seed or garden farms nearly laid out. (*Jg.* 786.)

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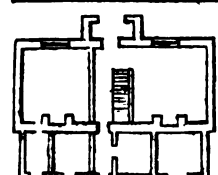


3. Buildings.

Wanted one of the largest houses in the kingdom; in 1823

pulled down. Another well known. Mistry Hall a most

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striking place. (See field, Thanet, the latter finely wooded by the scientific Lord Petre. Many others; but some districts of the county with very few. The latter are good, out buildings numerous and convenient; expensive rich covers and barns. Cottages not very good; some built after a better plan. (*Jg.* 767.) by the Marquis of Buckingham, with a garden of one-fourth of an acre to each. Joseph Fox at East Horndon, finding labor dear and servants difficult to be got, took the plan of having them to building their cottages and attaching gardens.

4. Occupation.

Some of the largest farms in the kingdom are so early as 1791 A.D. *Young* found some in 1808 and 1809 a year.

Lord Burybrook farms 1100 acres, Lord Petre 1600. Many farmers men of information, ingenuity, and exertion

Tithes average 4s. 9d. to 6s. per acre when compounded for. Many farms held on running leases terminable or renewable every seven years. The refusal of leases increasing.

5. Implements.

Essex plough, a large unwieldy implement, with two wheels. A great variety of swing ploughs, all bad compared with the Rotherham kind or Northumberland plough. An iron road-clearing plough by Western. A concave roller and scraper attached, delineated in the report, but no reason given for the shape. Many cultivators, scufflers (fig. 768.) &c. delineated, and a donkey hoe. Some of Pasmore of Doncaster's threshing mills, and winnowing machines, in use. The Scotch cart, plough, and other improved implements introduced by Western. Flemish scythe tried, but found not to answer; did not understand its use. Pattison of Maldon has made an ingenious improvement of the common sowing basket; he has made the bottom a wire sieve for sifting out the seeds of weeds in the motion of sowing, and attaches a cloth bag beneath for catching them. An ant-hill machine. Good specimens there of amateur improvements on implements.

6. Enclosing.

Essex for ages an enclosed county; still some waste to enclose. Hedges broad and mixed plants, and with pollard trees.

7. Arable Lands.

Cultivated better than nine in ten of the other counties: plough with two horses or three horses abreast without a driver; fallows universal; rotations good; potatoes cultivated to a great extent for the London market. Carrots in various places planted for seed three feet apart; produce five or six cwt. per acre, sometimes ten or twelve. Eye-groats disliked generally; wireworm comes after it, and is sure to destroy them. Rape, ribwort for seed; hops in a few parishes. Rainsford succeeds well on poor calcareous soils; some lucern. Wireworm often injurious to young wheat, after clover leys; rolling and treading lessens its effects; on strong soils slugs very troublesome.

8. Grass Lands.

Extensive marshes and salt-lings, (or salt-leats.)

9. Gardens and Orchards.

Some cherry orchards at Burnham; many cottages without gardens.

10. Woods and Plantations.

Fifty thousand acres chiefly natural and ornamental scenery. Some fine old elms at Gosford. At Saint Oeth the three original Lombardy poplars which Lord Rochford brought from Italy about 1758, and from which the greater part of those in the kingdom have been raised; they are seventy feet high and seven feet three inches in circumference, five feet from the ground; a Portugal laurel more than fifty-two yards in circumference, and a very large arbutus. The largest apple trees in England at Bellhouse, Avelly; large elms; Lord Petre has sold thirteen oaks for 600*l.* at 1*l.* a load including top and bark. Oaks at Hatfield worth 100 guineas each. Hatfield broad oak celebrated, but now in ruin. An oak at Wimbish increased in girth, four and a half inch in thirteen years; a larch two feet nine inches in the same time; the larch, however, was younger.

11. Wastes.

Fifteen thousand acres; said that in James the First's time almost the whole county was waste.

12. Improvements.

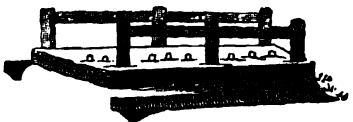
A good deal of draining; a machine in use like the Flemish mouldboard (fig. 64.) for lowering the surface of ploughed

lands at those places where they intend making *segs-furrows* to carry off the water from the regular furrows. The draining (see 387*h.*) in use, inventor not mentioned. Chalk much used as a manure.

13. Live Stock.

Essex never famous for this branch. The largest dairy farms at or near Epping, famous for its butter and cream; no particular sort of cows kept; Derby and Leicestershire breeds preferred, but any taken; fed on natural and artificial grasses in summer, and hay and grains in winter. Dairies built on the north sides of the farm houses; milk kept in troughs lined with lead, which hold nine to ten gallons of milk, five to six inches in depth. This in winter is skimmed four, and in summer two or three times, and the cream, after being kept three or four days, churned; milk given to hogs. A few cows kept for milk; in other places for suckling calves, and feeding on the marshes. Western has the finest swine in the county; feeds them in what he calls a hog cage; a cage which effectually prevents the animal from taking exercise. A hog half fat put into a cage gains fifteen pounds a week, if well fed with barley meal and water. A miller, near Maldon, has made a treble case on wheels, to keep moving about on grass land, for its improvement. A portable bridge, carried on a pair of wheels, for passing sheep over marsh ditches, in use by Wakefield of Bourham. (fig. 769.) A decoy for ducks and other aquatic

769



birds in Mersa island, the largest in the county. Every person that approaches a decoy, takes a piece of lighted turf stuck on a table fork in his hand to prevent the ducks from smelling man. Without this caution they will quit the pond. A decoy at Goldhanger, at which one waggon load and two cart loads of dun birds were taken at one haul of the nets; but the disturbance so frightened such as escaped, that no more were taken that season. Seven fish ponds at Spaines Hill for carp, tench, and eels. A chain of ponds at Leighs Priory, belonging to Guy's hospital, near a mile in length, and occupying about thirty acres, once completely sluiced and carefully cultivated, now dry and neglected.

14. Rural Economy.

Labor done generally by the piece.

15. Political Economy.

Roads mostly good; few canals; various fairs; and some cattle markets. In the creeks of Crouch, Blackwater, and other rivers and estuaries, considerable quantities of oysters are deposited for breeding. The produce is afterwards dredged and deposited at Wivenhoe and other places for feeding. What are called Colchester oysters are fed there, and sent to Hamburg, Flanders, and France, in time of peace, as well as to London. Oysters are also dredged on the Hampshire coast, and fed in the Coln, or Colchester beds. No distinct account of the oyster economy, however, is given in the report. There are salt-water ponds for various sorts of sea fish in Foulness island; the fish are caught in weirs on the extensive sandy coasts, and deposited, when plentiful, in these ponds, whence they are dragged for with small nets, as wanted.

Manufactures of woollen have existed from time immemorial in the county; also of sacks, hop bags, calicoes, balze, lime, bricks. Much balze made at Colchester, Cogge's Hall, and other places, for Spain. A society of agriculture at Chelmsford.

6997. HERTFORDSHIRE. A surface of upwards of 400,000 acres, the north part forming a chalky ridge, which extends across the kingdom in this direction; the general features are rich, woody, and the agriculture various, chiefly tillage; the corn produced, equal in quality to any in the kingdom. *Ellis, a well known agricultural author, farmed in this county. (Walker's Report, 1795. Arthur Young's Survey, 1807. Marshal's Review, 1818.)*

1. Geographical State and Circumstances.

Climate, dry and healthy.

Soil, chiefly loam and clayey loam, next chalk, and a small part bordering on Middlesex gravel; vales, rich sandy loams, chiefly under pasture, and woods very beautiful.

2. Property.

Much divided, the county being a favorite one for wealthy persons building villas and other retreats. 7000*l.* a year the largest estate; great part copyhold, which sells here at six years' purchase less than freehold.

3. Buildings.

Hatfield, Cassiobury, Ashridge (partly also in Bucks), Goshambury, Brocket, the two, the Grove, Glatton, Wye Park, &c., noble mansions. Brown's farm yard, at North Mims, one of the best in the county. Immense barns at North Mims and Bedfordbury. Outlets to the eaves of farm buildings at Alkenham; wide fattening stalls, with conveniences for giving hay, water, and oil-cake. Cottages seldom with land attached. A moveable sheep house, at Hillhouse, a curious expensive affair, of which plans, sections, &c. are given in the report.

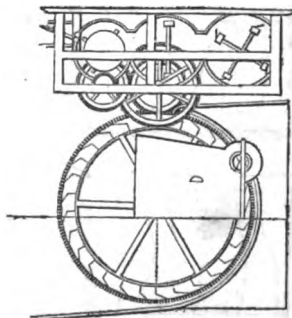
4. Occupation.

Farms small, largest 500 acres; many of the very small farmers who rent 20*l.* a year worse off than day laborers. Sir John Selwight, of Barnwood, a scientific breeder, farms 700 acres, 300 of which is in arable and well cultivated. The Earl of Bridgewater, at Ashridge, farms 500 acres, besides the park of 1080 acres. The Marchioness of Salisbury farms 290 acres, besides the park of 1080 acres, and has made many curious experiments; a prejudice against leases.

5. Improvements.

Push large and unwieldy, with two large wheels, the same as figured in old farming books 150 years ago. One or two threshing machines of Mettles' kind. (fig. 770.)

770



6. Enclosures.

Various, but still some commons and open fields; old fens of mixed species; new ones of thorns; planting well understood, but the cut with the bill made in a direction downwards instead of upwards, as in Berwickshire, by which the stem throws out a brush of small twigs at the wound, instead of a few strong healthy shoots.

7. Arable Land.

By far the greater part of the county in tillage: crops chiefly wheat, barley, and oats; turnips and clover supposed to have been introduced in the time of Oliver Cromwell; depth of ploughing generally four or five inches. Grog, who has written a tract on managing clay lands without naked fallows, ploughs as deep as the staple will admit. Rotations various, generally with a naked fallow, once in three, five, or seven years, or oftentimes Combing or ribbing in use in some places instead of drilling. Turnips cultivated broad cast, and very poor crops produced; cabbages grown to a large size by the Marchioness of Salisbury, for cows; large red sort preferred. Carrots, parsneps, beets, &c. cultivated by the Marchioness on her experimental farm. Good sainfoin on the chalks. Drilling corn crops with Cooke's drill practised in various places. Water cress for the London market, cultivated in the streams at Rickmansworth. Sixty acres of furze for faggots at Ashridge.

8. Grass.

Quantity small, and chiefly a narrow margin near Barnet, on which hay is grown for the London market; some good meadows on the Stort.

9. Orchards.

Apples and cherries abound in the S.W. corner of the county on farms of from twenty to fifty acres. In ten years after planting, cherry trees begin to bear; produce till the twentieth year, six dozen pounds when full grown, fifty dozen pounds; price, ten-pence to three shillings a dozen. Caroon, and small black, the favorite sorts. Kentish will not thrive here. None of the apples for cider: orchards kept in grass, but not mowed.

10. Woods.

The cope kind abound in the northern and in many parts of the county; produce faggot wood and hurdles; cut at twelve years; black willow, ash, and hazel, best for hurdles; alders bought by turners and patten makers. Pine woods, natural and artificial, at the Earl of Clarendon's, the Grove, near Watford. A superb oak at Panshanger, E. Cowper's; seventeen feet round at five feet from the ground; called the great oak in 1709: on a soil gravelly above, but, doubtless, clay below. The timber in Moor Park of great antiquity, and in a state of decay; many immense pollards; and, on the whole, one of the most forest-like parks near London. Vast oaks and beeches at Ashridge and Beechwood. Beech excels there; also cedars and the oak, ash, larch, spruce, and common pine excellent. Beech sold to turners, chair-makers, and for barrel staves.

6998. BUCKINGHAMSHIRE. 393,600 acres of hilly surface, and chiefly of clayey or loamy soil; a considerable part chalky, and the agriculture nearly equally divided between tillage and grass. (*Survey by St. John Priest, Secretary to the Norfolk Agricultural Society, 1810. Malcolm's Survey, 1794. Marshall's Review, 1818. Smith's Geological Map, 1820.*)

1. Geographical State and Circumstances.

Climate. cold and windy on the Chiltern Hills.

Soil. chiefly clay and chalk, with some gravelly loam; Chilterns wholly chalk; vales generally clay.

Minerals. Some ochre, used in painting; a quarry of good marble at Newport, but too deep to be profitably worked; a freestone quarry near Olney.

Water. Numerous rivers and canals for sending produce to market; but often filled with weeds, bushes, and other obstructions, which, after heavy rains, occasion frequent floods: a "commission of waters" proposed by the reporter as a remedy.

2. Property.

Some large estates, as those of the Dukes of Bedford, Buckingham, &c.; tenures very various: a description of lands here called yard lands (*vigilant terra*), which entitle the holders to certain rights of common.

3. Buildings.

Stowe, and Ashridge (the latter partly in Herts), the first of Grecian; the other of Gothic architecture, the two noblest mansions in the county. Tynningham, Wycombe Abbey, &c. also very good houses, and many others: some good farm-houses, and the dairies very clean and neat; churning often performed by horse machinery; the churns of the barrel kind. Lord Carrington has built some good farmhouses, and the Marquis of Buckingham some very complete cow-houses. Drake has a good circular pigeon-house, with brick cells or lockers in rows, with shelves before for the pigeons to light upon; fre-

11. Improvements.

Underdraining clay by numerous parallel cuts filled with straw, wood, or stones general: manuring well understood; much brought from London of every sort; bones, soot, sheep trotters, night soil, oil-cake dust, rags, leather clippings, furs' clippings, horn-shavings, malt-dust, hair, sticklesticks, &c. &c. dressings more frequent than in any other county. Chalk a very common manure on clayey soils; laid on unburned, and left on the surface to be pulverized by heat and rains, or frosts and thaws; then harrowed with a bush harrow, to spread it, and ploughed in. Some irrigated meadows at Rickmansworth and other places; but the frequency of mills is against the process.

12. Live Stock.

All the spare clover, hay and straw, carried to London, and manure brought out in return. Sir J. Sebright prefers Suffolk cows and horses, and uses the Wiltshire sheep. A good many house lambs suckled about Rickmansworth, fed with grains and malt-dust in winter. Folding sheep generally approved of. Soiling with clover and tares common. Grey wethers Suffolk oxen in harness, four to a team. Hon. G. Villiers prefers the Glamorganshire oxen for work; and thinks stall-fed oxen can hardly be kept too warm; prefers oil-cake for finishing to every thing else; Lady Salisbury has the wild breed of pigs, which fatten to forty-eight stone; feeds on lettuce, which is found to answer well. Stevenson, the baliff, bred a gardener, which renders him a superior cultivator of green crops. Lord Clarendon feeds deer (6620,) and sells them. Poultry at the Grove kept in wheeled coops about twelve feet long and two and a half wide, boarded on one side and open on the other; these are wheeled up and down the park, and a boy attends them to keep away hawks. In the poultry yard distinct houses for all sorts of fowls; the roosts so contrived that they may not run on another.

13. Rural Economy.

Ploughmen generally hired by the year.

14. Political Economy.

Good roads; few manufactures excepting plating straw, which is very general in the county, especially about Dunstable, St. Albans, Redburn, &c. Weak wheat straw from chalky and white land, and such as grows under trees or on hedges preferred. The platters give from two-pence to four-pence a pound for it, and sort it themselves. Much male made about Ware and Hertford for the London market.

quently white-washed, to keep them free from bugs. A foot-bridge at Fawley Court, movable upon two pivots at its ends, and being heavier on one side than the other, always hangs perpendicularly, excepting when any one walks upon its light side, when the weight of the person keeps it flat; hence it admits the passage of men, but not stock: cottages good, and mostly with gardens attached: some at Brickhill worse than piggeries. Sir J. D. King gives premiums for the best cultivated gardens; also gives clothing and other rewards for good conduct in servitude.

4. Occupation.

Size of farms moderate: number in the county 2039; one of 1000 acres, one of 900, four or five between 600 and 700 acres, ten between 500 and 600, twenty-four between 400 and 500, and the rest from 400 down to ten acres; average, 179 acres. Westcar, of Kreslow, a celebrated grazier, occupies 900 acres, of which only between sixty and seventy are arable. Very few leases, and those given with very objectionable covenants. Lord Carrington and other more enlightened proprietors grant leases.

5. Implements.

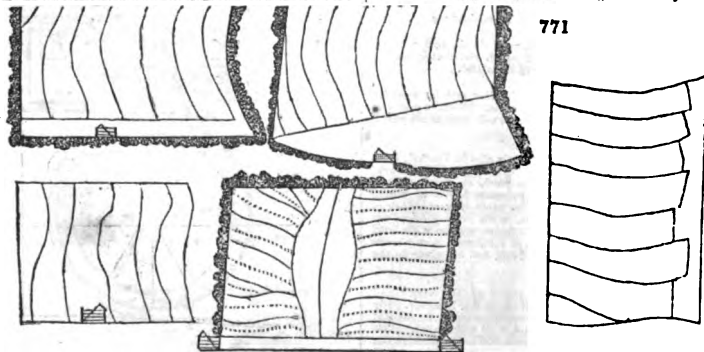
Swing ploughs and four horses in a line common.

6. Enclosing.

Has gone on rapidly; old hedges razed, and with many ash and oak pollards.

7. Arable Land.

Ridges high, crooked, with waste spaces between, around, or at the ends. (fig. 771.) Fallow in general every third year,



most common rotation fallow, wheat, beans: chief grains, wheat and barley; beans drilled and hand sown; some turnips on the light lands.

8. Grass.

Pastures a prominent feature; those in the vale of Aylesbury,

especially thence to Bicester, very rich; generally fed, but occasionally mown. Removing and hills called bonking, a piece of management to which the renters of grass lands are generally bound in their leases. They are removed by skinning, galling, or gutting, and kept down by rolling; thistles are spread; size of grass fields from twenty to 300 acres.

9. Gardens and Orchards.

Few of either worth notice: cherries are grown at Hackwell Heath, for the London and Aylesbury market.

10. Woods and Plantations.

Willow pollards planted round the margins of fields, on soils suitable for hurdle wood. Birch, the most common timber, very abundant; chiefly used for manufacturing chairs: woods constantly full of young plants from the mast, which grow up and succeed those which are felled; thus the same timber on the same soil and surface for ages. At Shardeole, a beech seventy-five feet from the ground, to the first bough: oak and beech trees in Ashridge Park, containing from three to six loads of timber: very fine beeches at Milsenden; mast given to pigs.

11. Improvements.

Draining much wanted; well performed on some bogs on the Marquis of Buckingham's estates by digging a well and boring in the bottom till the spring was tapped, and then leading it off in an underdrain; paring and burning in general use for bringing grass land to tillage: chalk much used as a manure, sixty or seventy loads per acre, once in twenty-one years, or forty once in twelve years; allowed to lie on the surface for one winter at least before being ploughed in. Only one instance of irrigation worth notice, which is at Cheneys, by a tenant of the Duke of Bedford.

12. Live Stock.

Cattle kept chiefly for beef and butter, seldom for cheese or work; Hereford oxen preferred, and next the Devon; Holderness cows for the dairy; some prefer the long horned Lancaster, and others the Suffolk; many of the Holderness cows, after being kept a few years, are sold to the London cow-keepers; men are generally the milkers; only one instance found of women performing that operation. Earl of Bridgewater keeps eight teams of Welsh, one of Sussex, and one of Durham oxen, all yoked as horses; five used in the cart, and four in a plough; a few other gentlemen have ox teams; cattle generally fed off in summer: cows kept during winter fed on straw, hay, and oil-cake; little herbage or roots in use; milk generally kept in flat vessels of lead; some wooden trays, tinned, in use; skimmed every twelve hours; in some few places three times a day; cream from first two skimmings kept by itself; the third skimming makes what is called after-butter; skimming dish, if tin, circular, a foot in diameter, with holes in it, and a handle upon the top of it; butter made twice a week, in churns of the barrel kind, usually turned by a horse; time allowed for the butter to come, an hour and a half; butter made up in lumps of two pounds each, and sent to London in square flat baskets, eleven inches deep, holding from thirty-six to 150 pounds. They have each on three of their sides three marks, the number of pounds the basket holds; a letter, denoting the farmer's name from whom it is received, and the name and residence of the carrier. The baskets and butter cloths are the property of the carrier; all that the farmer has to do is, to carry his butter to the nearest point where the carrier passes, and to make his agreement with his butter-factor in London, and receive monthly, or otherwise, the payment. Quantity of butter made, six pounds per cow per week, at an average, when in good keep, and not nearly dry. Calves generally sold to sucklers; a few suckled in the county, and a few brought up as stock.

Sheep. Culture directed to the fattening of lambs, and the

breeds preferred are the Dorset, and next the Gloucester and Berkshire.

Horses generally soiled; five or six put to a plough in many places, and never less than three. A team of asses kept by the Marquis of Buckingham for the use of his garden; many used at the potteries at Amersham.

Pigs, an important article on account of the milk from the dairies; bred the Berkshire, and next, the Chinese and Suffolk.

Ducks, a material article at Aylesbury and places adjacent; breed white, and of an early nature. They are bred and brought up by poor people, and sent to London by the weekly carriers. One poor man had before his door a small pit of water, about three yards long and one yard broad; at two corners of this pit are places of shelter for the ducks, thatched with straw; at night the ducks are taken into a house. In one room belonging to this man (the only room he had to live in) were on the 14th of January, 1808, ducks of three growths, fattening for the London market; at one corner, about seventeen or eighteen, four weeks old; at another corner, a third corner a brood of a week old. Ducks six weeks old sold at that time for twelve shillings a couple. Besides the above, there are other persons who breed many more ducks than the person now mentioned, and, as far as it was possible to discover, this person sends 400 ducks in a year to London. Allowing then forty persons to send only as many, at an average of five shillings per duck, the return of ducks from Aylesbury alone will amount to 4000*l.* per annum. This return has been magnified into 20,000*l.* per annum.

13. Political Economy.

Rye-roads extremely bad and dangerous; difficult to be discovered from mere drift ways; turnpike-roads not to be commended; canals various and useful; grain sent to London at two shillings per quarter. Box clubs generally established for the poor; no agricultural society in Bucks. Principal manufactures paper and lace.

14. Miscellaneous.

In calculating the number of acres Priest the Reporter tried the mode, first shown by the Bishop of Llandaff, of weighing the portion of paper containing the map; he next took an exact copy of Cary's map upon paper, by tracing its outline, after the map was strained upon a canvas blind at a window. This copy was cut out with great exactness by a sharp pointed knife, and then divided into pieces, which were so neatly laid together, as to form a right-angled parallelogram; another piece of paper was cut into the form of an assumed parallelogram longer than necessary, upon which the pieces of the copy were laid, and cemented by gum-water, so as to fill all parts of a right-angled parallelogram shorter than that assumed; the difference between the assumed parallelogram and that formed by the pieces of the copy of the map, was accurately measured and subtracted from the assumed parallelogram, and the remainder gave 391,040 acres, the measure of the number of acres in Bucks. Thus then we have the number of acres taken from Cary's map, by weight 396,013, by measure, 391,040. From which, if we take an average, we shall probably state it as accurately as it can be found to be 393,546 statute acres, which, for the sake of round numbers, we will call 393,500 statute acres.

6999. BEDFORDSHIRE. An irregular parallelogram of 290,000 acres, not much varied in surface, and for the most part of a clayey soil. The agriculture chiefly directed to the raising of wheat, barley, and beans, but of an inferior description in many respects. Little pasturage; scarcely any market orchards, but good vegetable gardens established at Sandy, on the east of the county, from time immemorial. Great exertions made in every department of culture by the late and present Duke of Bedford, by whom were employed many valuable men in conducting improvements, as Farey, Smith, Salmon, and Pontey. A valuable set of experiments on grasses, conducted by Sinclair under the direction of the present Duke. (*Stone's Bedfordshire*, 1794. *Butcher's Bedfordshire*, 1808. *Marshal's Review*, 1818. *Smith's Geological Map*, 1820.)

1. Geographical State and Circumstances.

Climate, mild, genial, and favorable to the growth of vegetables; rather later than Hertfordshire; prevalent winds S.W.; coldest winds N.E.

Soil, chiefly clay, next sand, and lastly in the southern extremity embracing flints, chalk. Some of the sands gray silica, and producing nothing but heath, others more loamy, as about Sandy, which is supposed to contain the best garden-ground in the county.

Minerals, some ironstone; limestone abounding with cornea ammonis and other shells, petrified wood, gryphites, blemnites; freestone, chiefly lime, at Tattenhoe.

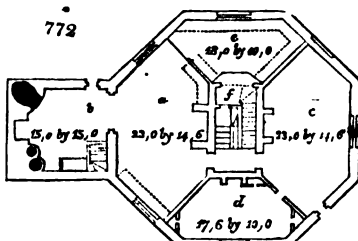
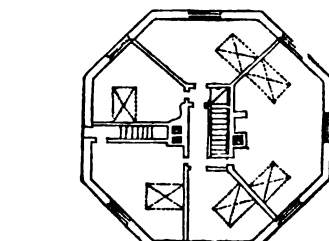
Water. Principal river the Ouse; several mineral springs.

2. State of Property.

Duke of Bedford's estates the largest, next Lord St. John's and Whitebread, united rental estimated at 40,000*l.* a year. Estate managers attorneys and considerable farmers.

3. Buildings.

Several farm-houses were formerly the seats of gentlemen who farmed their own estates. Farm-houses in general badly situated, seldom at the centre of the farms to which they belong, and generally consist of piecemeal erections. Francis, Duke of Bedford, erected an octagonal farm house, on a most commodious plan. (fig. 772.) On the ground floor it con-

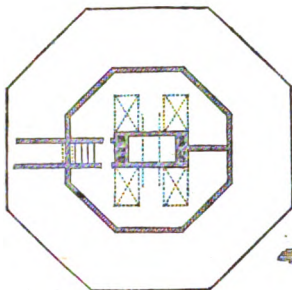


tained a large kitchen (a), bake and brew-house, and wash-house (b), a hall or master's room, with a cellar under (c), a good parlour (d), a dairy (e), besides a pantry (f), closets, and a new and six cellar under. On the first floor were five, and on

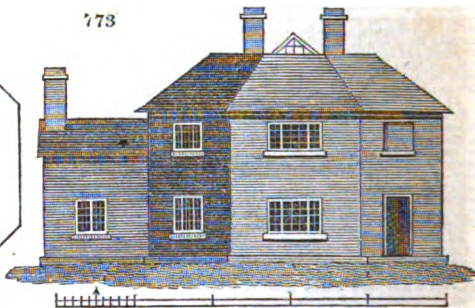
the second (fig. 773.) two good bed-rooms. The expense of this house on the octagonal plan was 671*l.*, had it been built in the square form it would have cost 733*l.* It is built of brick, slated, and was designed by Mr. R. Salmon, a well known

mechanist, resident at Woburn. The same accommodations on a square plan forms a house very convenient for placing furniture. (Fig. 774.) Wattle and dab, that is, clay plastered on hedge work of splinters, or on wood frame work, and also

the *Plaf* manner of clay-working, in use in some places, both for farm-houses and cottages. *Plaf* walls found warmer and cheaper than any other, and when whitewashed said to make good cottage walls.



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4. Occupation.

Many farms of from 800 to 500 acres; average 150 acres; Duke of Bedford's farms generally of the average size. Farmers much improved by the example of Woburn and the annual meetings. The experiments made by Francis Duke of Bedford were to ascertain the quantities of hay consumed by working oxen; comparison between large and small cattle as to food; comparative value of different foods, &c. Tithes mostly in lay hands; farms held generally from year to year, some on leases of fourteen or twenty-one years.

5. Implements.

Plough of the swing kind, with a wooden board and a wedge nailed on as a mould board, one fixed handle, and a loose one called a plough staff; the whole singularly rude, though in general use throughout the county. Improved forms of all machines introduced by the Duke of Bedford's Northumbrian manager, and other enlightened men. A good straw cutter and winnowing machine, invented by Salmon; also an excellent weighing machine.

6. Enclosing.

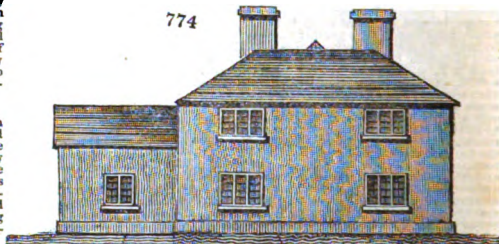
Formerly three-fourths of the county unenclosed, now chiefly enclosed.

7. Arable Land wretchedly ploughed.

Fallows, which occur on the clays generally once in three years, badly worked. Usual crops are fallow, wheat, beans,

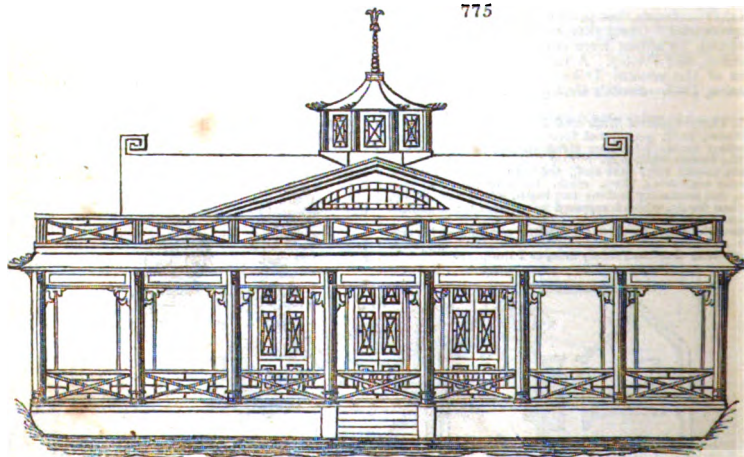
or fallow, barley, beans; turnips common on the sands and chalks, sown broad-cast, and hand-sown. Chicorey was tried by the Duke of Bedford, who found it yielded ample produce; had twelve acres which, in 1797, kept six sheep per

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acre from the second week in April till Michaelmas; four and a half kept ten sheep an acre from the second week in April till 22d July, and then seven per acre to end of October. Sheep thrive well and free from diseases.

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8. Grass Land.

Of very limited extent, and in many places covered with sedge (*carex*), and ant-hills.

9. Gardens and Orchards.

Gardens of Sandy and Girtford long celebrated for the excellence and abundance of their culinary vegetables. Soil a deep sand, of a yellowish brown color; products pears, beans, cucumbers, potatoes, parsnips, and carrots, radishes, cabbage plants, and turnips; sent to market in all directions to the

distance of sixty miles. Cucumbers chiefly to London, and sold at ten and twenty shillings a bushel for pickling. Orchards small. Potatoes, gooseberries, and other small fruits grown in cottage gardens.

10. Woods and Plantations.

About 7000 acres, situated on the slopes of hills on cold marly clays. Various new plantations formed by the principal proprietors, especially the Duke of Bedford. Farms grown on some of the sandy hills, for burning lime. Some fine trees of

the silver fir, and others of the genus *Pinus* at Woburn, planted under the direction of the celebrated Miller; a fine beech, figured by Poncey in his *Forest Pæneus*.

11. *Wastes.*

Four thousand acres of chalky down at Dunstable, not much any where else.

12. *Improvements.*

A good deal drained, especially bogs. Eikington's mode said to have been tried with very partial success. Bush and straw-draining attempted on the clayey soils, and the mole plough a good deal used in the furrows. Irrigation introduced by the Duke of Bedford, and various examples are to be found in different parishes on his Grace's estates. Peat is used as fuel, and also burned for the ashes as a manure; ample experiments made on manures, by Dr. Cartwright, at Woburn; but no agricultural experiments on a small scale can be depended on. The dairy at Woburn (fig. 775.) is a fanciful structure in the Chinese style; but the plan and arrangement is not well calculated for keeping milk and butter cool and sweet.

13. *Live Stock.*

Cattle, a mixed breed of long and short horned Alderney, &c. Some dairying conducted as in Buckinghamshire. Some sheep, but of no particular breed; folding generally practised and approved of; horses a heavy breed from Huntingdonshire; rabbit warrens destroyed as much as possible; geese kept by many from an idea that they preserve the health of the pastoral animals where they feed. Turkeys and geese kept behind the enclosure in various places, but now much on the decline. Bees kept by a few cottagers and small farmers.

14. *Rural Economy.*

Husbandry generally performed by day laborers; though on most large farms a housekeeper, cowkeeper, shepherd, and kitchen maid hired by the year.

15. *Political Economy.*

Almost all the cross roads, and many of the main roads very bad. Grand Junction Canal passes through a part of the county, and is very useful; fairs and markets various; manufactures chiefly plaiting of straw and lace; children of ten or twelve years of age acquire the art of plaiting while their mo-

thers sort and bleach the straw. Lace making, a more sedentary employment, and the women and children generally appear sickly. There are schoolmistresses for teaching both straw plaiting and lace making. Begin to learn lace at six or seven years of age; do little good for two years, at ten years earn two shillings a week, at sixteen as much as can be made by the business, or nearly six shillings a week; work in summer from six o'clock in the morning till sunset, and in winter from nine till eleven at night; maid servants scarce in consequence, but poor rates kept down. Some rush mats made near the Ouse to the west of Bedford.

Bedford House of Industry.—"The poor in the house are employed in the following manner: A manufacture of coarse bales furnishes employment for all the boys five years of age, and some of the men; the remaining part of the men cultivate an acre and a half of garden-ground, and weed and keep in order twenty-five acres of sward land attached to the house. The old women spin flax to make linen for the use of the family; the other women (exclusive of those engaged in domestic concerns), and girls above six years old make thread lace. One-sixth of the earnings of the idler is paid weekly to those who work, by way of gratuity. The Governor of the House of Industry adds, that the above employments have answered the most sanguine expectations of the directors of the establishment."

5. Many useful benefit clubs.

16. *Obstacles to Improvement.*

Want of knowledge and leases. Mice generally destroyed by professional rat catchers; some farmers keep ferrets for the rats. Larks destroy a great deal of new sown wheat. They, with other birds, are very abundant in Bedfordshire, especially about Dunstable, where they are caught in traps, in quantities for the London market. Wire worms supposed to be increased by artificial grasses.

17. *Miscellaneous.*

An agricultural society founded by the Duke of Bedford in 1801; various premiums offered and paid, to the extent of 100*l.* a year in some years. Cheap publications on agriculture, it is thought, would be a considerable means of improvement.

7000. HUNTINGDONSHIRE. A dull flat surface of nearly 800,000 acres; till Edward the First's time one continued forest. The soil is almost uniformly good, but injured by water; it is chiefly under tillage, but remarkable for no excellence in agriculture. Rape-seed and mustard are more cultivated than in most other counties, and timber more rare. (*Stow's Huntingdonshire*, 1793. *Marshall*, 1793. *Parkinson*, 1811. *Marshall's Review*, 1813. *Smith's Geological Map*, 1821.)

1. *Geographical State and Circumstances.*

Climate. Generally healthy, considering that the east part is skirted by fens, and but a small part supplied by water from springs.

Soil. Loam prevalent, but the county every where spotted with roundish patches of clay, sand, marl, fen, moor, or lakes, which, in the map of soils annexed to Parkinson's Report, assumes a very singular appearance.

Water chiefly supplied from ponds; Ouse and Nene the only rivers; the meres are natural ponds, surrounded by reeds and other aquatic plants, and a considerable zone of marsh or bog, according to the soil may be loam or sand. Whittlesea Mere contains 1570 acres.

2. *State of Property.*

Old enclosed lands in the hands of a few proprietors; half the county freehold, the remainder almost all copyhold.

3. *Buildings.*

Farm-houses very inconveniently situated, partly owing to the want of high dry sites on central parts of farms; many good cottages lately erected as the only means of retaining farm servants for any length of time with the same master.

4. *Occupation.*

Many large farms, though small ones predominate; lessens frequent; tillage in kind.

5. *Implement.*

Floath, with one handle, originally from Holland; one wheel, a circular plate of iron which is kept sharp, acts as a coulter.

6. *Tillage.*

Floath with a pair of horses, or three abreast; two crops and a fallow the common rotation; chief crops, wheat, oats, and beans; rape sown on the fens; lands either once ploughed out of grass, or never a third of the whole surface. The rich meadows in the vicinity of Wisbeach consist of a mixture of sand and clay, or silt; and the uplands consist of chalk, gravel, loam, and tender clay. There are no minerals.

Rivers. The Ouse, the Great Ouse, and the Nene and Great Ouse cross part of the county, and the old and new Bedford rivers. All these are navigable for barges, and are kept open in frosty weather by ice-boats, drawn down the stream by eight horses, four on each side.

7. *Estates.*

Very much in size. Those of Lord Hardwicke, Duke of Bedford, Duke of Rutland, Sir H. Peyton, and Thorpe, are

after rape; hemp sown in a few places; mustard cultivated with great success; sometimes paid for as seed on land worth not more than 50*l.* but very uncertain. Parkinson thinks hemp, flax, rape-seed, and mustard, should be encouraged, as they enrich the farmer, and are all good preparatives for wheat. The only way, he says, to enrich the soil, is to enrich the farmer first.

7. *Grass.*

Some good meadows on the Ouse and Nene; the pastures lie remote from the farm buildings, but are in general rich, though neglected; require to be pared and burned, and brought under aration.

8. *Woods and Plantations.*

A good many pollard willows in the fens, and some other plantations.

9. *Improvements.*

Great general county drainage, such as that of the Bedford level, in the adjoining counties of Lincoln, Cambridgeshire and Northampton. The advantages of such a drainage is ably pointed out by Parkinson. Embankments very extensive, and the soil being in general a loose porous sand, puddle walls are generally made in the middle of the mound.

10. *Live Stock.*

Still less now chiefly made at Little Dalby, in Leicestershire; is no longer made at Stilton, though it is supposed to have been originally made there about 1730; or, according to some, by a Mrs. Orton, in 1750. A good many horses bred, and a mixture of Lincoln and Leicester; folding sheep much practised. No fewer than 271 pig-wash houses in this county, and a few bees; one gentleman cultivates rabbits.

11. *Political Economy.*

Beads; a lace manufactory at Kimbolton; a paper mill at St. Neots; two sacking manufactories at Standground; an agricultural society at Kimbolton.

the largest; greatest part of the county in estates of from 200*l.* to 500*l.* and 1000*l.* per annum; many from 20*l.* to 50*l.* and even 400*l.* a year, occupied by their owners; tenures of all sorts, and a variety of college-land tenures.

3. *Buildings.*

Farm-houses and premises in general bad and inconvenient; lath and plaster, or clay and wattle, the common materials, and clunch or clay walls in general use. Jennings, of Bottisham, has adopted Arthur Young's plan of building stacks on frames, which run on an iron railway, and are pulled into the barn, where they are forked on to the platform of the threshing machine. Cottages "wretchedly bad," excepting a few built by Lord Hardwicke, and some other gentlemen.

4. *Occupation.*

Farms from twenty to 100 acres; many from 100 to 1000, but few exceed the latter number; tithes taken in kind in many places.

5. *Implements.*

Floath, with a sharp iron wheel, or running coulter, as in

Huntingdonshire. Shepherd, of Chippenham, has invented a variety of immense threshing machines, and the best Lothian implements, at Lord Hardwicke's. The *Ely bar roller* is an iron roller, with a number of pieces of iron like small spades fixed into it. It is used in the fenny districts for cutting up the weeds, which choke up the slow running rivers. The horse walks along the bank, and draws it several times up and down the river. The weeds are thus rooted up, and carried down the stream by the first flood.

6. Arable Land.

Ploughed and cultivated in general as in Huntingdonshire; hemp is cultivated more extensively; flax is grown, and mustard, near Wisbeach and (butwell); a few lentils, as in Huntingdonshire, but are considered of less value than tares. The reporter says, a second crop of mustard is obtained by what shells from the first, and that mustard springs up in land where it has not been cultivated for upwards of a century. Wood is in cultivation, and for every forty acres a wood mill, 1,500 ft. is required. No crop pays equal to the reed, which requires no culture but cutting and bunching; owing to the improvement of the fens, they are now becoming scarce. Whitedress (*Poa aquatica*), or fen hay, is produced on many parts of the fen lands, and even on such parts as have been dug for peat. The land is inundated till the crop appears above the water, and then, wherever it can be effected, it is left off; in other cases the grass grows to a great height in the water, is mown twice in the season, and often produces two tons per acre each time. The hay is esteemed valuable for cows; causing them to produce much milk; it is said, giving the particular flavor to Cottenham cheese.

7. Grass Lands.

Extensive; some under no management, and of little value; others very productive, both as hay and feeding lands. In the district called the Wash, they will carry from one to two bullocks, and from five to twelve sheep per acre fed the greater part of the year.

8. Gardens and Orchards.

Good market and fruit gardens at Ely, Soham, Wisbeach, &c. which supply Lynn and various places, by water carriage, with apples, cherries, and vegetables.

9. Woods and Plantations.

Some young plantations. The Rev. G. Jennyns, of Bortolham, "does not cut off the tap roots of oaks in the usual manner, and finds they thrive faster." (That he is mistaken, see 3646.) Oeiers are grown in various places for the basket makers, and found to pay as well as a crop.

10. Wastes and unimproved Fen.

In 1794, 138,000 a.

11. Improvements.

In no part of the island draining and embanking so much wanted as in the fens of this country.

The former state of the fen lands, and their degradation to their present state, is given at length in the report, chiefly from a pamphlet by Lord Hardwicke. It was the opinion of Atkins a commissioner of sewers, in the reign of James I. (1604) that these fens (a space of upwards of 280,000 acres) were once "of the nature of land-meadows, fruitful, healthy, and very painful to the inhabitants, and yielded much relief to the high-land countries in times of great droughts." Sir W. Dugdale (who was born in 1625 and died 1686) was of the same opinion, adding as a proof, "that great numbers of timber trees (oaks, firs, &c.) formerly grew there, as is plain from many being found in digging canals and drains, some of them severed from their roots, the roots standing as they grew, in firm earth, below the moor."

On deepening the channel of Wisbeach river, in 1655, the workmen, at eight feet below the then bottom, discovered a second bottom, which was stony, with seven boats lying in it, covered with all. And as Whitteson, on digging through the moor at eight feet below the surface, found with weeds of grass lying on it, as they were at first mown. Henry of Huntingdon (who lived in the reign of Stephen, 1155), described this fenny country "as pleasant and agreeable to the eye; watered by many rivers which run through it, diversified by many large and many small lakes, and pastures, and islands." And William of Malmesbury (who lived in the first year of Henry II. 1154), has painted the state of the land round Thorney in the most glowing colors: he says, "it is a very paradise, in pleasure and delight it resembles heaven itself; the very marshes abounding in trees, whose length without knots do emulate the stars." "The plain there is as level as the sea, which, with the flourishing of the grass, allureth the eye; in some parts there are apple-trees, in others vines." It appears then, on the authority of the authors quoted, that the fens were, in former times, a fertile, formerly meadow and wood, now fen, became so from partial embankments preventing the waters from the uplands going to the sea by their natural outfalls; want of proper and sufficient drains to convey those waters to the Ouse; neglect of such drains as were made for that purpose; and the evils increased from the not embanking the river Ouse, and the erection of sluices across it preventing the flux and reflux of the sea: the not widening and deepening, where wanted, the river Ouse; and from not removing the gravels, weeds, &c. which have from time to time accumulated in it.

The first attempt at draining any part of the fens appears to have been made in the time of Edward I. (1272, &c.); many others with various success followed. The famous John of Gaunt (or Ghent, who died in 1359), and Margaret, Countess of Richmond, were amongst the draining adventurers, but Gough, in his addition to Camden, says "the reign of Elizabeth may be properly fixed on as the period when the level began to become immediately a public case. Many plans were proposed and abandoned between that time and 1653, when King Charles I. granted a charter of incorporation to Francis, Earl of Bedford, and thirteen gentlemen adventurers, with him, who jointly undertook to drain the level on condition that they should have granted to them, as a recompense, 95,000 acres (about one-third of the level). In 1649, this charter was confirmed to William, Earl of Bedford, and his associates, by the Convention Parliament; and in 1653 the level being declared completely drained, the 95,000 acres were conveyed to the adventurers, who had expended 400,000*l.*, which is almost $\frac{1}{4}$ of the price on the 95,000 acres, and about $\frac{1}{16}$ of the whole breadth, if the whole level contain 255,000

acres, and it is generally supposed to contain 300,000 acres. In 1654, the corporation called "Commissioners of the level of the fens" was established. This body was empowered to levy taxes on the 95,000 acres, to defray whatever expenses might arise in their preservation; but only 83,000 acres were vested in the corporation, in trust for the Earl of Bedford and his associates; the remaining 12,000 were allocated, 10,000 to the King, and 2000 to the Earl of Portland. At first the levy was an equal acre tax, but upon its being deemed unjust, a gradual one was adopted, which is now acted upon. In the year 1697, the Bedford level was divided into three districts, north, middle, and south; having one surveyor of each of the former, and two for the latter. In 1753, the north level was separated by act of parliament from the rest. In addition to the public acts obtained for draining the fens, several private ones have been granted, for draining separate districts with their limits, and notwithstanding which, and vast sums expended, much remains to be done; a great part of the fens is now (1806) in danger of inundation; this calamity has visited them many times, producing effects distressing and extensive beyond conception, indeed many hundred acres of valuable land now drowned, the misfortune aggravated by the proprietors being obliged to continue to pay a heavy tax, notwithstanding the loss of their land.

The interior drainage of the fens is performed in most places by windmills, which are very uncertain in their effects. Steam has been tried, and there can be no doubt would be incomparably preferable, as working in all weathers.

Embanking may be considered a necessary accompaniment of draining on the fen-lands. The fens are divided into three large levels, and each of these levels are subdivided into numerous districts by banks; but as these banks are made of fenn-moor, and other light materials, whenever the rivers are swelled with waters or any one district is deluged, either by rain, a breach of banks, or any other cause, the waters speedily pass through these bright, moory, porous banks, and down all the circulating districts. The fens have sometimes sustained 20,000*l.* or 30,000*l.* damage by a breach of banks; but these accidents seldom happen in the same district twice in twenty years; the water, however, soaks through all fen banks every year in every district; and when the water mills have lifted off the waters up out of the fens into the rivers in a windy day, a great part of the water soaks in the porous banks, and in the night upon the same land again. This water that soaks through the bank, drowns the wheat in the winter, washes the manure into the dykes, destroys the best natural and artificial grasses, and prevents the fens from being sown till too late in the season. This stagnant water, which is very warm, causes also fen agues, &c.; thus the waters that have soaked through the porous fen banks have done the fertile fens more real injury, than all the other floods that have ever come upon them. The remedy for the soaking through of the water is obviously that of forming a new wall in the middle, which appears to have been first thought of among the fen bank-makers by Smith of Chatteris, a professed embanker, who thus describes his mode of putting a vertical stratum of puddle in old bounds. "I first cut a gutter eighteen inches wide, through the old bank down to the clay (the fen subsoil being generally clay), the gutter is made near the centre, but a little on the land side of the centre of the old bank. The gutter is afterwards filled up in a very solid manner with tempered clay, and to make the clay resist the water, a man in boots always treads the clay till the gutter is filled up. This plan was tried last summer (1794), on the fens of the fens, and a vast acre of wheat were sown on the land. The wheat and grass lands on this farm are now all dry, whilst the fens around are covered with water. This practice answers so well on this farm, that all the farmers in the parish are improving their banks in the same manner, and some have begun in adjacent parishes.

With respect to embanking from the sea, Vancouver is of opinion, that the ground ought to be covered by nature with samphire or other plants, or with grass, before an attempt is made to embank it; there is a great deal to be done, and it is greedy. "If the sea has not raised the salt marsh to its fruitful level, all expectation of benefit is vain, the soil being immature, and not ripened for enclosure; and if again with a view of grasping a great extent of salt marsh, the banks or sea wall be pushed further outward, the water will be driven to a more secure foundation for it to stand upon, the bank will blow up, and in both cases great losses and disappointments will ensue."

Ploughing and burning is every where approved of, and considered the best use now of the fen district, in breaking up turf. Without it corn crops are destroyed by the grub and wire-worm.

Irrigation. Col. Adesne, of Barbrham, has 300 acres of meadows, which have been irrigated from the time of Queen Elizabeth. Pallavicino, who was collector of Peter's pence in England, at the death of Queen Mary, having 30,000*l.* or 40,000*l.* in his hands, had the art to turn Protestants to the accession of Queen Elizabeth, and appropriated the money to his own use; he bought with it an estate at Barbrham, and other lands near Bournebridge; and procuring a grant from the crown, of the river which crossed through them, was enabled legally to build a sluice across it, and draw as much of the water as was necessary into a new canal of irrigation, which he dug to receive it in the method so well known, and commonly practised in Italy long before that period. The canals and the sluices are all well designed, and are the work of a man evidently well acquainted with the practice; but taking the waters from them for spreading it by small channels over the meadows, there does not seem to be the least intelligence or knowledge of the husbandry of watering. No other art is exerted but that merely of opening in the bank of the river small cuts for letting the water flow into the meadows as much as they can, and never longitudinally, so necessary in works of this kind. The water then finds its own distribution, and so irregularly, that many parts receive too much, and others none at all. From the traces left of small channels in different parts of the meadows it would appear that the ancient district was formed under Pallavicino is lost, and that we see nothing at present but the miserable patch-work of workmen ignorant of the business. Irrigation has not spread from this example, but might be extensively practised on the banks of all the rivers."

12. Live Stock.

Cattle, a breed peculiar to the county; but some of all sorts. Butchers give more for a Cambridge calf than a Suf-

folk one, smoozing the former whiter veal. The Cottenham cheese is ascribed to the excellence of the grass, in great part *Poa aquatica*.

The *cow system* consists chiefly in suckling of calves and making of butter; there is not much cheese made, except the noted one of Soham and Cottenham. The suckling season is from Michaelmas to Lady-day. It requires, on an average, two cows to fatten a calf. The cows, when at a distance from home, are milked in the pasture, and the milk brought home by a horse or ass, in tubs, slung across: women could not do this work, the travelling being, after the least rain, very bad, even when there is no water to go through. The butter is sold rolled up in pieces of a yard long, and about two inches in circumference; this is done for the convenience of colleges, where it is cut into pieces, called "parts," and so sent to table; its quality is no where excelled.

Sheets of various kinds fattened on grass, and when not ready in autumn, put up and finished on corn or oil-cake. Col. Audean buys in London at a falling market, and keeps till a rising one before he sells.

Sheep chiefly as in Huntingdonshire; some Norfolks and South Downs; folding on the uplands. *Horses* of the cart kind much bred, and considered an article in which the county excels; they are very large and bony; black; with long hair from the knees to the fetlock trailing on the ground. A cart stallion has cost 250 guineas, and his colts

have sold for sixty guineas. Horses kept in the stable throughout the year, at a great expense, because on dry food; herbage plants, artificial grasses, and roots being neglected, and no soiling practised.

The deer in Wimpole park attacked by a singular disease, a sort of madness; the diseased animal begins by pursuing the keeper, seizes him, breaks his antlers against the trees, and gnaws large pieces of flesh from his sides, &c. becomes convulsed, and soon expires.

Pigeon-houses on almost every farm; kept in a great measure because if any one were to give them up, he would be obliged to keep the pigeons of others; destroy thatched roofs, and oblige every farmer to sow more seed than he otherwise would; produce sent to London and other parts; often 100 dozen per annum from one pigeonry; dung highly prized.

13. Rural Economy.

Peat, sedge, or thin turf, and dried cow dung used as fuel. The cow dung is spread on grass, about 1½ inch thick, and cut into strips, eight or twelve inches square; there it lies till dry.

14. Political Economy.

Roads miserably bad; canals or navigable cuts in the fens in all directions; a few fairs; a pottery at Ely for coarse ware; excellent white bricks made there, and at Chatteris and Cambridge; lime burnt at various places.

7002. SUFFOLK. A crescent-like flat surface of 800,000 acres, the soil chiefly clay, and the agriculture directed to the growing of corn. The county is, however, famous for its breed of cows, horses, and hogs, and it is one of those in which carrots are a good deal grown. The celebrated Arthur Young was a native yeoman of the county, and farmed his own estate near Bury. (*Young's Suffolk*, 1810. *Smith's Geological Map*, 1819.)

1. Geographical State and Circumstances.

Climate. One of the driest in the kingdom; and the fens severe; and the N. E. winds in spring, sharp and prevalent.

Soil. The predominating a strong loam on a clay-marl bottom in the centre of the county, a zone of sand along the coast, and some sand and fen land in the north-west angle; no minerals.

2. Property.

Chiefly in the hands of rich yeomanry, who cultivate their own estates from 1000. to 4000. a year; one estate of 80000. a year; and two or three of 5000.

3. Buildings.

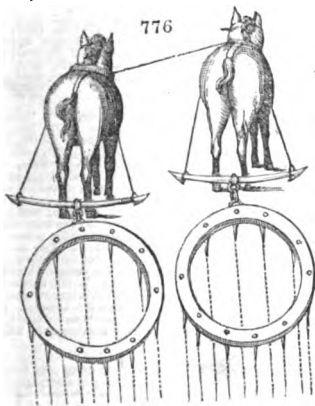
Great erections have been made for the convenience of men of large fortunes; but none for those of smaller incomes; farm houses improved, but still inferior to what they might be; often of lath and plaster, and wanting requisite repairs; barns uselessly large; cottages in general bad habitations; the door generally opens from the external air into the living room; repARATION bad, and the deficiency of gardens general.

4. Occupation.

Farms generally large; some from 200. to 1000. a year; generally from 1500. to 9000.; the largest on the sandy districts. Leases for seven, fourteen, and twenty-one years; much land held at will.

5. Implements.

The Suffolk swing plough, well known as one of the best of the old English ploughs; various threshing machines, and other improved implements introduced; circular harrows. (*See* 776.)



6. Enclosures.

Suffolk one of the earliest enclosed counties in England; a few recent enclosures.

7. Arable Land.

Plough, with two horses, one acre a day on stiff soils, and 1½ to 1½ on sands; ploughing skilful, and subscribe prizes among themselves for such as draw the straightest furrow, &c. Besides all the common crops, a larger proportion of pease grown than is usual in most counties. Hops, cabbages, carrots, lucern, chicory, and hemp, are grown in a few places. The culture of carrots is, of course, confined to the sandy districts; and that of rape for seed, and of hemp, to the fenney angle of the county. A. Young seems to have been the chief cultivator of chicory, having had "ninety acres of it for sheep." Hemp is grown both by cottagers and farmers, and for the seed as well as fibre, but never on a large scale; five acres is the greatest breadth to be met with.

8. Grass.

Pastures coarse and not extensive; both these and meadows badly managed, overrun with mole and ant hills, bushes, tufts of bad grasses, weeds, &c. Hay-making badly performed.

9. Gardens and Orchards.

Gardens built of the width of a brick, by making them wavy. (*Encyclopaedia of Gardening*, 1567.)

10. Woods and Plantations.

Few, and pay badly; but large oak timber formerly produced in the clay districts.

11. Improvements.

Wheat substituted for rye. Draining much practised on the clays; bushes, straw, or stubble used for filling them; claying and marling the sands practised, but sand laid on clay found of no use, or marl on clay, according to the old adage—

Marle clay, throw it away!

Marle sand, and buy land.

Some workmen procured from Gloucestershire to execute irrigations in the manner of that county.

12. Live Stock.

In cows, horses, and hogs, Suffolk excels. The Suffolk breed of cows spread over the whole county. To keep the breed polled, horned calves are never reared, but sold to the sucklers. Cows in prime give eight gallons of milk per day, and great part of the season six gallons; best milkers red brindle, or yellowish cream colored; not always the best feeders. Often fed in winter with cabbages. A point of bad management is, that the bulls, when three years old, or thereabouts, are either sold or castrated for fattening, by which means, when a good stock-getter is thought to be discovered, when searched for he is no more; thus no improvement can be made in the breed, but by accident. Cows are allowed to range over turnip fields and eat where they please, and often eat the same as to cabbages. In some cases they are tied to posts in the open field, littered, and the vegetables brought to them: both barbarous modes of management. Dairy management not particularly good; women in general the milkers; milk generally seven or eight pints an hour for a wagger milked thirty in three hours. Quality of milk depends not only on the food, but on the condition of the cows as to health and fatness. Chafing dishes of charcoal kept in the dairies during frost, but the cream does not rise so well. Butter generally salted in firkins.

The sheep used are the Norfolk breed, or as they ought rather to be called the Suffolk breed, with which folding is universally and anxiously practised.

Horses of the best variety found on the sandy soils, as about Lowestoft, Woodbridge, &c. About the middle of last century a considerable spirit of breeding, and teams drawing against teams for large sums, existed. The old breed were ugly, with slouching ears, ill-shaped head, and low in the fore end; a great carcass, short legs and short back; they could only walk and draw, and no more trot than a cow; of late, by aiming at coach horses, the breed has become handsomer, and one of the best for draught in England. In the east district, horses are turned out of the stable in winter at night, about eight o'clock, into a yard well littered with straw, with plenty of oats barley straw to eat, but no hay; so treated, they are found to keep free from diseases, and work several years longer than if kept constantly in stables.

The hogs fatten early and at little expense, but are not great breeders.

Rabbits. Many warrens in the sand district; one at Brandon returns 40,000 rabbits in a year; twenty rabbits per acre usual produce; carcass defrays rent and taxes, and the skin profit; so that no mode of farming can be more profitable to the occupier.

Poultry. Turkeys generally cultivated, but chiefly for home use.

Pigeons abound on the borders of Cambridgeshire.

13. Political Economy.

Roads very good; made with flints and gravel; some canals, Ipswich and Bury excellent markets; a good deal of fishing on the coast; spinning and combing wool, and spinning and weaving hemp among the cottagers. Bays and silk manufactures at Sudbury. Various hundreds in this county incorporated by charter for erecting houses of industry for the poor; they manufacture for the fishers, spin and weave, and cultivate a few acres of land; they are admirably kept and managed, and the poor live like the pensioners in Chelsea college; but these houses of industry have little effect in lowering the poor rates. Mar-

shall consider them as the grave of morality and independent politics.

14. Obstacles to Improvement.

The great abundance of game in the county is such, that inclosures are given of corn having been injured to the extent of

7003. NORFOLK. A flat surface of 240,000 acres, chiefly of a loamy and sandy soil, and devoted to the growth of corn, and the fattening of cattle and sheep. This county has acquired celebrity for its general culture, and especially for that of turnips and clover. It displays a great variety of practices, and abounds in wealthy farmers. It is also noted for the estate of Coke, a true patriot, the most munificent of landlords, and greatest friend to farmers. Norfolk, in short, was formerly reckoned the finest county in England for agriculture, as Northumberland is at present. Mackie's nursery at Norwich, the property and under the direction of a lady, is one of the most extensive and best managed of provincial nurseries. (*Kent's Norfolk* 1795. *Young's Norfolk*, 1801. *Marshall's Review*, 1813. *Smith's Geological Map*, 1819.)

1. Geographical State and Circumstances.

Climate colder and more backward than Suffolk; N. E. winds severely felt in spring; salubrity of the air affected by the fens of Lincolnshire and Cambridgeshire to the extent of 5 or 600,000 acres, which lie on the west side of the county.

Soil. A sandy loam or sand; Kent says, similar and equal in value to that of the Austrian Netherlands. There is a small patch of silt or warp clay on the borders of Lincolnshire, and of rather stiffer clay on the borders of Cambridgeshire.

Water. The sea and rivers for navigation; watering ponds for cattle made at Holkham, each to serve four enclosures, forty-two feet square at bottom, twelve and seven feet deep, bottom and sides well covered with sand; within a yard of the top, the clay two feet thick, and paved with bricks set on edge. These ponds made by men from Gloucestershire at two and sixpence per superficial yard. To divide the ponds for four fields, a large stone with a hole wrought in it to receive a post, is necessary at the centre, and the post has mortices to receive rails from the sides.

2. Property.

Estates of all sizes; one of 25,000*l.* a year, one of 14,000*l.*, one of 15,000*l.*, two of 10,000*l.*, many of 5000*l.* Land sold currently at thirty years purchase. Tenure by freehold three-fifths, church, collegiate, and corporate estates one-fifth, and copyhold under lay lords one-fifth.

3. Buildings.

Some noble seats of proprietors. Kent says farm buildings are on "too large a scale;" they are always crying out for barn-room, though wheat is preserved cheaper and better on stables; barns on a farm of 100*l.* a year that have cost 500*l.* Coke has expended an excellent plan on farm houses; barns at Holkham 120 feet long by 30 broad and 30 high, surrounded with sheds for sixty head of cattle; walls of fine white brick, and roof of blue slate. At Lyderstone an immense barn of Coke's, containing the crop of 140 acres. Seven men necessary on the goff or roof at the unloading of every wagon, and dare not venture to tread the corn for fear of bursting the barn; farmers fond of immense barns. In building Coke has substituted milled lead for ridge tiles to the roof; copper waders to all locks; front edges of mangers are rollers covered with tin, managers themselves plated with iron; bottoms of the stall fences of Penryn slate. In building walls not to be roofed, they are drawn in to a brick's length at top. Lime-wash used as a preservative to boards, walls, &c.: it is composed of lime fresh from the kiln, and clean sharp sand, mixed with hot water, and laid on hot; stirring it up so as always to lay on sand with the lime. An excellent plan at Holkham a brick manufactory, where bricks of all forms are made, and common bricks are cut, five parts in six, through in various directions, so as to give half and quarter bricks, angles, &c. without breaking and waste. This is one of the most-complete manufactories in the kingdom. At Belsey a capital farmery, labourers' cottages and gardens. Sharp clean sand dashed on new paint found to answer the end of imitating stone, &c. A. Young did not see a good farm yard in the county.

Cottages much wanted; some built of flint-work.

4. Occupation.

Farms large on the dry soils and smaller on the wet ones; 2000 acres arable, the largest measuring from 400 to 600. Farmers famous for their improvements, excellency of their management, and the hospitable manner in which they live, and receive their friends and strangers. The farming-mind of the county has undergone two revolutions, one between 1750 to 1760, when great improvements were made, and the next about 1790, when drilling began to be introduced. Coke began to promote farming, and the South Down sheep were introduced about that time. The great improvements for seventy years past effected in consequence of twenty-one years leases. The advantages of leases ably advocated by Kent. Coke adheres steadily to this term, while some others are reducing it to seven and nine years.

5. Implements.

For more than half a century these remained stationary; now improvements making; Norfolk plough has a high pitched beam, wheels near to the share, and is reckoned lighter than most wheel ploughs.

6. Enclosures.

Many since middle of eighteenth century. In planting hedges on a loamy soil, the plants being laid in, and the bank over them raised to the usual height, the face of it, and also of the ditch for one foot or more below the original surface is plastered over with clayey stuff taken out of the bottom of the ditch, to the thickness of two or three inches, or more about the sets. The advantage of this plan is, that this loamy puddle from the bottom of the ditch, is without the seeds of weeds itself, and by its compactness, excluding the air from these in the mould below, it prevents them from germinating;

7004. OXFORDSHIRE. An irregular, inland, elevated surface of 450,000 acres, chiefly in aration, and in a very backward state as to agriculture. There are rich grass lands, subjected to the same dairy management as in Buckinghamshire, and some natural wood lands. The principal agriculturist and patriot of the county is Fane, of Wormaley. (*David's Report*, 1794. *Arthur Young's Oxfordshire*, 1809. *Marshall's Review*, 1813. *Smith's Geological Map*, 1823.)

1. Geographical State and Circumstances.

Climate, cold and bleak. On the Chiltern hills, cold, moist, and foggy.

half and three-fourths of its value by hares and pheasants, which are common every where, and on the sand districts more especially.

An agricultural society, called the Milford society, meets alternately at Milford and Bury.

the consequence is, hedges planted in this manner require little or no weeding for several years.

7. Arable Land.

Plough with two to four horses very shallow; carefully preserve the hard basis formed by the sole of the plough, which is called the *pas* of the land; breaking this up is said to let down the riches into the hungry subsoil, &c. Culture of turnips erroneously stated by Kent, to have been introduced from Hanover by Townsend, in the reign of Geo. I.; doubtless has increased since that period. Clover very general, and wheat on the clover ley; turnips all broad-cast, or if drilled, never on ridge-tops, but on the flat surface; rotations good, such as turnips, barley, clover, wheat, &c. Turnips fed off with sheep, or given to cattle stalls, or the open yard; sometimes carted on the sown wheats in February, and eaten off them by sheep or bullocks, the soil being very dry and loose; clover eaten off, or mown for selling or hay; — most generally eaten off by ewes and lambs. Wheat divided in some places, a practice which originated in this county, and has scarcely been adopted in any other. Carrots not so much cultivated as in Suffolk; a good deal of mustard from March to Wisbeach; on the rich black lands, four crops of mustard taken in succession, and then wheat; produce three to four quarters per acre. Hemp and flax cultivated in the spots of ground belonging to houses of industry, and in some other cases, but to no extent. Sainfoin not much cultivated; Coke had 400 acres. Lucern at a few places; mangels introduced by Sir Mordaunt Martin, who continues to cultivate it. Drilling and dibbling of wheat and peas generally practiced on the sandy soil. Coke drills all his corn. Arable culture in every department greatly improved since 1790. — A paper by Kent, entitled *Fallowing exploded*, has been justly condemned by Marshall, and other men of more general experience in culture: his notions of shallow ploughing, and continual tillage and cropping without rest, most erroneous, and contrary to experience.

8. Grass.

Very little of natural turf in the county, transplanting turf recently introduced. (514*l.*)

9. Gardens and Orchards.

Orchards to most of the farm houses; some public ones near the large towns. Norfolk best in an excellent apple, and much used for baking dry in ovens, a very particular operation known only to a few bakers. They are repeatedly taken out of the oven, and pressed flat with the hand, and then put in again.

10. Woods and Plantations.

Much planting has taken place on the poorer sands; Marshall, of Stratton, the chief planter, and next to him, of Bracton, Coke, and Windham. From 1781 to 1801, Coke planted 718 acres, with upwards of two millions of trees and shrubs, of more than fifty kinds. Bevan, of Riddleworth, 966,000 trees. Marquis Townshend feeds cattle, sheep, and deer with the trimmings of plantations. Sheep are fond of the bark of the Scotch fir and ash.

11. Improvements.

A good deal of draining done of late years; very little irrigation; among the manures are reckoned marl, lime, gypsum, oyster shells, sea oaks, sea weeds, pond weeds, burnt earth, sticklebacks, oil cake, rape cake, ashes, soot, malt dust, ploughing in growing buck wheat, yard dung, leaves, burning stubbles, river mud, and town manure. Marling, or clay-ing as it is called, has been much used for an unknown length of time, and is found of great use on the sands; laid on at all seasons, but chiefly on the clover leys in autumn, and spread in spring, before ploughing for peas or oats; quantity, twenty to eighty loads an acre; duration, twenty to fifty years. Sea oaks, a calcareous mud, forty loads per acre. The sea mud is chiefly part of a stratum of rotten timber on the sea-shore, and which is washed out by the tides; it is perfectly black and rotten, and ten loads manures an acre. Burnt earth is the burnt ash of moorland heath, and of cottagers who burn turf, &c. Leaves raked, stubbles burned, &c. by some. Some judicious and successful embankments made on the Ouse, near Lynn, by the late Count Bentick, and continued by his son, the present Governor Bentick.

12. Live Stock.

Predominant cattle Scotch, bought in every year from the drovers, for feeding. Norfolk black legged sheep gradually giving way to South Downs; folding on the decline. Poultry good, especially the turkey, owing to the dryness of the soil, and great range of pasture. Decoys, and pigeon houses, formerly numerous, but now on the decline. Rabbits, hares, pheasants, partridges, and ducks abundant.

13. Political Economy.

Chas. II. observed, that Norfolk should be cut into roads for all the rest of England; few canals.

Soil in three great divisions, red land, stonebrash, and chert, or chalky hills; the best of all these soils is calcareous; there is also a considerable portion of loamy soil.

2. Property.

Few large estates; church tenures very common, one estate of 20,000l. a year, one of 12,000l., one of 7000l., and one of 5000l., and so on.

3. Buildings.

Blenheim, the noblest in England; Maylands' house, at Broadland, recorded by Young, as a model for houses, which cost about 20,000l. building. In farm buildings, the best thing is the coped stone rick and granary stands; farm buildings generally of stone, covered with stone slate; wretchedly contrived, and badly executed in most parts of the county. Gardens to most of the cottages. Bishop of Durham has built some very comfortable ones at Mungewell.

4. Occupation.

Farms generally smaller than in most other counties; few above 500 acres. Leases of fourteen and twenty-one years not uncommon, many of seven years. Farmers in general very ignorant, and much prejudiced against new practices.

5. Implements.

The prevailing plough, a swing mouldboard implement, drawn by from three to six horses, and incapable of making good work under the guidance of the best ploughman.

6. Arable Land.

Very badly managed in general; on heavy lands two crops and a fallow; but the fallow kept unploughed for the sake of affording couch grass leaves for the sheep. Davis, of Bloxham, an extensive farmer and land-surveyor, "never saw any land upon which a naked fallow is necessary; not even on the stiffest soils," has been in many counties, and employed on twenty-six commissions of enclosure at the same time. Wheat sown early, and either ploughed in or folded; often both. A scantling of lentils cultivated. Turnips in most parts seldom bigger than apples. A good deal of sainfoin on the Chiltern, and other calcareous soils, also on the Stonebrash, which is chiefly lime.

7. Grass.

Some good meadows near Oxford, on the Thames and Isis; very rich grass land at Thame.

8. Woods and Plantations.

Of considerable extent. A great part of the forest of Whichwood belongs to the government. Great attention paid by Fane of Wormsley, to pruning; many beech woods on the Chiltern hills; young wood at Blenheim neglected. The natural forests of Whichwood and Stoken Church, chiefly of beech, but some oak, ash, birch, and aspen.

9. Improvements.

Fane, Frax, and Davis, and others, are of opinion, that the agriculture is much superior to what it was thirty years ago, chiefly from the introduction of a better breed of stock, the use of roots and herbage-plants, and the enclosure of commons and common fields.

Scotch Farming. In 1809 an attempt was made to improve the estate of Great Tew by letting it to Scotch farmers. As this originated in consequence of a pamphlet which the compiler of the present work published in 1808, it might be deemed a defect in this sketch, if the circumstance was passed over without particular notice. It will, no doubt, long be recollected in the county as at least a ruinous project of wild adventures, this being the very mildest term applied to failures in similar cases. At this distance of time, looking back on the matter, as far as the result affected ourselves, with our natural *sensu fidei*, we shall state our opinion as to the causes of failure. This resulted principally from too great anxiety, both in the landlord and tenants, to reap a large benefit; and secondly, from the general fall of prices both of land and produce, which succeeded to the published report of the Bullion Committee in 1807. Anxiety to increase the rent-roll induced the landlord to let the whole of his estate of nearly 4000 acres, then under nearly a score of tenants, to two cultivators, instead of trying first the effect of one or two moderate sized farms under the new mode. The same anxiety induced the tenants to offer too high rents, and to attempt a profit by subsisting. Before the season had been eight months let, it was sold on the new rental for nearly four times the sum at which it was offered for sale, only a year before; but the title not proving satisfactory to the purchaser the purchase was never completed. The landlord became involved in difficulties owing to the expenses of new buildings, roads, drainages, the purchasing up of certain outpings, and other

7005. BERKSHIRE. One of the most beautiful counties of England; occupies a surface of 474,000 acres, of which about 200,000 are enclosed, or in parks or plantations, 190,000 in common fields and downs, 40,000 in forests, wastes, and commons, and 8977 in roads. Its productions are almost equally corn and stock; it produces a good deal of butter and cheese, and the breed of swine is noted for its excellence. The celebrated Jethro Tull was a yeoman in this county. George III. and E. L. Loveden, Esq. were among its most noted farmers. On the whole it is a county much more indebted to nature than to art. (*Pearce's Berkshire*, 1794. *Mavor's Report*, 1806. *Marshall's Review*, 1813. *Smith's Geological Map*, 1821.)

1. Geographical State and Circumstances.

Climate desolated, but in every part the air pure and salubrious; in elevations pure, piercing, and braced by its sharpness; in the vales relieves the weak organs of respiration by its soft and balsamic qualities; no storms known in the county. About Reading, vegetation nearly a fortnight earlier than in some parts of the county.

Soil, calcareous in general, but in some places gravel, and in a few clay; vale of the White Horse entirely chalk.

Minerals. None excepting chalk, Sanden stones, a sort of large siliceous pebble, in lumps scattered over the Wiltshire and Berkshire Downs, and frequently blasted and used for paving. In the vale of Kennet is a considerable stratum of bitumen, formed from prostrate trees and other vegetable bodies, and used for fuel, and also burned for the ashes as a manure. The ashes abound in sulphate of lime.

Water. Some artificial lakes for breeding fish. Loveden has one of thirty acres, and a "fish-house" cottage, with six apartments, immediately above the lake, which he took so as to prevent even the cottager from stealing the fish. Many gentlemen have ponds, which are let to tenants, and produce a crop, if it may be so termed, every third or fourth year, of carp and tench. The occupier stocks with yearlings about two inches long, obtained chiefly from Vately, on the neighboring confines of Hampshire. The breeders are about eight or nine

causes: he found that though one person had been willing to buy the estate held on twenty-one years' leases, yet that it would sell much better held at will; and was thence induced to buy up from the Scotch tenants the leases granted them two years before; and was still unsuccessful in endeavoring to sell the estate. At last the proprietor found himself with the greater part of his lands in hand, and one farm, it is proper to observe, was put under the management of an Irishman, who rendered himself notorious by some parts of his conduct, and finally left the country clandestinely; and whose actions have unfortunately often been confounded with those of the Scotch farmers. When peace was concluded in 1814, land fell still lower, and finally this estate was sold for less than half what it had been sold for in 1809; but still (which may be considered as remarkable), for about double what was asked for it in 1807. It is now (1825), probably not worth a third part of what was given for it by the purchaser, from the change in the times; so that even had the original scheme and sale worked well, it is probable that by this time both landlord and tenants would have been ruined, for more money might have been raised by mortgage on such an estate in 1810 than it would have sold for in 1820. The depreciation of the estate has been attributed to the breaking up of old turf, a most unfounded error, as there were not 1000 acres to break up, and of them only 250 were ploughed, and, as would have been proved had the convertible system been continued a few years, greatly to the benefit of the whole. We regret that the landlord, a most respectable man, should have suffered in this business; but he entered into it aware that he was incurring an extraordinary chance of loss for an extraordinary chance of benefit, and of course he takes the result as every man ought to do. Besides he has still a very handsome fortune.

As a trait of the spirit of the Board of Agriculture at this time we may mention that Arthur Young examined the estate a few weeks after it was sold at so high a rate; and drew up a remarkable report (a MS. copy of which, from his office, is in our possession) in favor of Scotch farming, which was published in the first edition of Sir John Sinclair's *Husbandry of Scotland*. In that report a disingenuous attempt is made to attribute to the Board the merit of the introduction of Scotch farming into this and other counties; whereas it was and is perfectly well known, that the Farmer's Magazine, the Scotch farmer Gourlay, late of Wiltshire, and our pamphlet, were the true causes of the general account of all the operations on Tew estate by Scotch farmers, will be found in *Designs for Farms and Farm Buildings in the Scotch Style*, adapted to England, &c. 4to. 1812.

10. Live Stock.

There is a good deal of dairying in the county; the permanent grass lands being chiefly occupied in this way. The practices are almost entirely the same as in Hampshire and shire. The butter is taken to London by wagons from all the principal towns. Much good dairying at Atterbury, A. Young asked John Wilson, of that neighbourhood, if he ever fed on straw? answer, "No; straw is a good thing to lay on."

Sheep, the Berkshire, Gloucester, Leicester, and other hardy breeds. Fane has tried crossing the Rylands and South Downs with Merinos; several other proprietors of farms have also tried Down Merinos and other crosses, and some the pure breed.

11. Political Economy.

Forty years ago roads "formidable to the bones of all who travelled on wheels," now they are much changed for the better. Birmingham canal and the Thames of immense importance to Oxfordshire. A good deal of wool, formerly woven into blankets at Witney; now very little. About the beginning of the last century the manufacture of polished steel was introduced. Woodstock, and flourished for half a century; at present nearly extinct. Steel chains have been made by weaving iron only two ounces, and sold for 170l. Scissars from five shillings to three guineas. The steel is wholly made from old nails of horse shoes. Leather breeches making, and glove making have succeeded to the manufacture of the former, and the latter thrives well: from 360 to 400 dozen of gloves are manufactured weekly.

12. Miscellaneous.

Dr. Sibthorpe, the late professor of Botany at Oxford, left 2000l. a year to endow a professor of Agriculture and Rural Economy, to be established as soon as the *Flore Græca* is completed. This will not be for some years.

pounds weight; but in the Berkshire ponds they are never sold to breeders, but are sold off to the inns at Henley and other places, when the ponds are drawn, which is generally once in four years, and weigh at that age about three or four pounds each. The value of land thus applied cannot average less than about twenty shillings per acre. The ponds are regularly laid empty, and the fish with which they are stocked, which are uniformly carp and tench, are taken out every third or fourth year. The pond is afterwards allowed to lie fallow for the remainder of the summer season, and is again stocked early in the ensuing year with yearling fry of the same species. The ponds in this parish are subject to an abundance of coarse, bony, insipid fish, denominated Prussian or German carp. As this species is carefully destroyed, it is wonderful they should increase with the rapidity and universality which they appear to do: every acre of pond, properly stocked and well situated, must produce an annual increase of from fifty to one hundred pounds weight. If artificially fed, the increase would be greater; or less, if the pond is not so situated as to receive manure from the circumjacent lands. By retail, the fish here are generally sold at a shilling per pound; but under particular circumstances they may sometimes be had as low as ten pence.

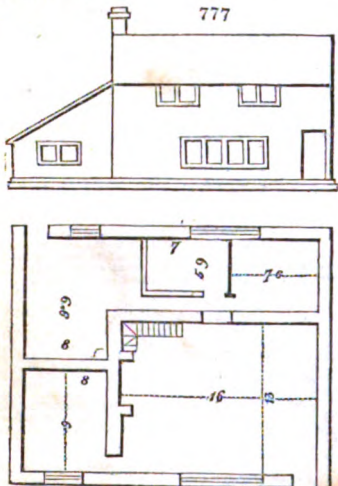
2. State of Property.

Largest estate 8000l. a year, a few of 5, 6, or 7000l.; E. Cra-

ven, and E. L. Loveden, Esq. the largest proprietors; several handsome seats with land not exceeding 100 acres, and many small freeholders and yeomanry. Some curious customs; at Enborne and Caddleworth manors, belonging to Earl Craven and R. W. Nelson, Esq., the widow of a copyholder, guilty of incontinency or marrying again, lost her freebench or life interest, unless she submitted to the ceremony of riding into the court on a black ram, and of repeating some well-known confessional lines. (See *Addison's Spectator*.) In the manor of Great Farinford the customary tenant's daughter, on being convicted of incontinency, was to forfeit the sum of forty pence to the lord, or to appear in court, carrying a black sheep on her back, and making confession of her offence in these words: "Eae porto pudorem posteriori meo." Many other curious customs.

3. Buildings.

Windsor Castle and many fine seats; houses of the yeomanry genteel and elegant; farm houses generally comfortable. Loveden's ample but ill arranged; cottages of the poor generally in a bad state, some present erections better. (fig. 777.)



Farmeries on collegiate or corporate lands generally in bad repair, because the fines for renewal of the leases take all the spare money, &c.

Chelsey Farm, near Wallingford, in 1800 the property of Lord Kensington, and formerly reputed to be the largest and most compact farm in England. Rent 1000*l.* per annum. Before the dissolution of monasteries it belonged to the Abbot of Reading, who had a seat here. The great barn in which his tithes were deposited is yet standing, and measures 101 yards in length and eighteen in breadth. The side walls are only eight feet high, but the roof rises to a great height, and is supported by seventeen stone pillars, each four yards in circumference. This construction is obviously judicious; high side walls, unless tied together by cross-beams, would have been in danger of being thrust outwards when the barn was filling with corn. This, as we have seen (7005.), is the case with the handsome high-walled barns of Coke.

4. Occupation.

One-third of the county occupied by proprietors. Farms of all sizes under 1000 or 1200 acres, but few exceeding 500 acres or under 50*l.* a year. Character of the Berkshire farmer stands high. "A hospitable style of living, liberality of sentiment, and independence of principle, are characteristic of the Berkshire farmer; to which he unites persevering industry and integrity in his dealings, which render him worthy of the comforts he enjoys." (Dr. Mavor.)

5. Implements.

The Berkshire wagon, one of the lightest and best implements of the wagon kind. The sort of draught chain described and recommended by Girt, (2613.) is in use on one estate, "the object is to prevent the draught of the trace horse from pulling down the thiller." The county plough a clumsy implement with wheels; a pressing plough (2515.) recently invented; it has three wheels with the tire wedge-shaped, and is intended "to press in the grips or channels made by the common ploughs, that no hollow places may remain for the seed to be buried too deep, &c." This sort of improvement is usual among amateur agriculturists, who have one implement invented to correct the faults of another, both of course bad. A number of other inventions, including a curious hand threshing machine, ingenious enough, but quite unnecessary, are figured and described.

6. Arable Land.

Plough generally with four or five horses at a snail's pace. George III. had two farms, one of 800 acres, cultivated in the Norfolk manner, and another of 450 acres, managed in the Flemish manner; 450 of the former, and 150 of the latter were arable. The whole delegated to the care of N. Kent, of Craigs Court, land-agent, and author of "Hints to Gentlemen of Limited Property," 1796. Rye cultivated on His Majesty's farms, and on the Downs. Some hops, wood, flax, and other plants not usually cultivated; seventy acres of lavender at

Park Place, on the side of a chalky hill, originally planted by General Conway, who distilled it himself at his coke manufactory. As the plants die they are replaced by others from a small nursery plantation. It begins to flower about the end of July, when nearly one hundred women and children are employed in cutting off the flower spikes, which are then in bundles, and send to the still house in baskets, carried by two men. The lower part of the stalks are then cut off, and the heads are put into the still, and distilled. The chemical oil, being separated, is poured into copper jars for sale.

7. Grass.

About one-fifth of the county under permanent grass, exclusive of the Downs and wastes. A tract of excellent meadow on the Thames, from the windings of the river, 105 miles in length, little irrigated, but a good deal flooded after heavy rains. Excellent meadows at Reading; those on the Kennet over the stratum of gravel, of rather a coarse quality. Mowing mesdoes not general, though they are for the most part mown once a year; upland pastures mowed when mown. Herbage, plants, and artificial grasses, a good deal sown. Meadows chiefly fed by oxen after being once mown. The dairy farmers occupy the poorer upland grassy districts, and the breeders of sheep the Downs.

8. Gardens and Orchards.

About forty acres of market garden and orchard at Reading, where onions are raised in great quantities; asparagus for the London and Bath markets, and cabbage seeds for the London seedsmen; good apples there and at other places; some elder made, and a good many cherries grown for market. Near Abingdon an orchard of twenty-one acres, containing 541 trees.

9. Woods and Plantations.

Extent of Windsor Forest, belonging to the crown, 5454 acres, including wood and water; private property, called Forest Land, 29,000 acres; encroachments 2,000 acres. The forest is under the government and superintendence of the Duke of York, lord warden, who appoints his deputy lieutenant, the rangers or head keepers of the several walks, and the under keepers.

Great part of the timber on the forest sold, as well as that retained, is very vulnerable and picturesque in appearance, but rotten or mildewed to the heart in such a way as to be fit only for fuel. This rot, or mildew as it is called, seems to be the natural process of decay, and is particularly fatal to beech trees, which are by no means so long lived as the oak, ash, &c. and others. Various young plantations on different estates, especially those of Loveden, Fiske Palmer, Wheelble, &c. Oxen bled on the moist parts of the Thames' meadows.

10. Improvements.

An account of the culture of Geo. III.'s farms, by Kent, dated 1798, is given as the greatest national consequence, &c. Oxen are used, both in farm and road-work, and the soil is the Norfolk wheel plough and the Suffolk iron plough. At a later period the Rotherham plough, and with which two oxen, yoked in collars, will plough, on the light soil of the forest, an acre a day. Draining in the Essex manner a good deal practised; the drains filled with straw, rubbish from brick kilns, wood, cinders, or gravel.

Peat ashes is a manure almost peculiar to Berkshire, though they might be obtained by the same process wherever peat of similar quality abounds, and are so obtained in Holland, and the ashes extensively used there, and sometimes shipped to this country. In the year 1745 peat was first burnt in Newbury, by a Thomas Rudd, who at the same time spread the ashes on clovers, for which they have ever since been famous. An acre of peat land at that period sold for 50*l.*; it has since sold, according to its quality, for 50*l.* and 40*l.*, and in one case, reached about 800*l.* per acre. Over the stratum of peat, which is about five or six feet deep, is a good meadow soil, and under the peat is gravel. The peat varies in color, but the blackest is reckoned the best, and is used for firing, the ashes of which are most esteemed, and have a reddish color. What is burnt for sale, is mixed with turf and other substances, which gives it a pale whitish hue. It is usually dug with a long-handled spade, from the middle of May to the end of June, and is conveyed from the spot in little wheelbarrows, to a short distance, when it is spread on the ground, and after lying about a week, the pieces are turned. This is done three or four times repeated, a heap is made in the middle of the place where the peat is spread, and in the centre of this heap some very dry peat is put, which being lighted, the fire communicates slowly to the rest of the heap. When it is completely lighted, an additional quantity of peat is put on the heap, and this operation is continued till the whole is consumed, which generally takes a month or six weeks, as quick burning is not approved of. Rain seldom penetrates deep enough to extinguish the fire. The heap is commonly of a circular form, and rather flat at top. At first it is very small; but at last it is sometimes two or three yards deep, and six or seven yards in diameter. The ashes being ridded, are conveyed away in uncovered carts, to a distance sometimes of twenty miles, and put into a house, or under a shed, to keep them from the wet, till they are wanted to be put on the ground.

The usual time of applying peat ashes is March and April. They are generally taken in carts, and sown on the ground before or after the seed is sown on the land. The quantity is usually from twelve to fifteen Winchester bushels per acre, according to the soil and crop. It is supposed that too large a quantity would be injurious. For barley, wheat, and peas they are not in much estimation; but for all sorts of artificial grass, more especially, they are preferred to all other manures. In turnips they assist to prevent the ravages of the fly; and in grass seeds the farmers reckon on an acre, manured with ashes, producing nearly a ton of hay beyond what it would have yielded without them. The effect is supposed to be of no longer duration than two years. On meadow land, from fifteen to twenty bushels may advantageously be put; they much improve the grass.

11. Live Stock.

Nor particularly breed of cattle; long horned most common. A dairying tract in the west of the vale of White Horse; much butter made, and some cheese of the single Gloucester kind. Calves a good deal suckled in some places. Biscuit parish famous for cheeses, in the shape of pine apples; they are of most excellent quality, and sell high. The curds are well worked with the hands, then pressed into a

wooden mould in the shape of a flower pot, and afterwards suspended from beams, rafters, or pegs, in an airy apartment, in a net, whose meshes indent their surface like a pine apple. Salt is then rubbed over them, or they are steeped in brine; weight, sibs. The milk is conveyed from the field to the dairies in what is called a tankard drawn by a horse or ass. (Æg. 778.)

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considered as very hardy, and particularly adapted for the low strong lands, and for folding.

Horses of the common heavy black race. Pearce calculated in 1794, that 12,000 horses were kept in Berkshire for the purposes of agriculture, and that one-third of the number might be saved by the use of improved implements; most of the horses are bought from the Northamptonshire breeders; many, after being kept a year or two at work, are sold for the London drays.

Hogs, the native breed one of the best in Britain; a cross with the Chinese, now more common than the pure native breed. Wherever there is a dairy, hogs are kept, but they are not counted a profitable stock to be fed with what would fatten cattle or sheep. Carcasses chiefly made into bacon; cured in the usual way, and dried in rooms heated with wood or coal. Larders have a bacon house, heated by a stove and flues. In farm-houses, much is smoke-dried in the chimnies with wood fires, which is supposed to have the best flavor.

Rabbits kept in warrens, in one or two places; and one gentleman rears tame rabbits of a pure white, the skins of which sell high for trimmings.

Poultry. Near Oakingham, many are crammed for the market, they are put up in a dark place, and crammed with a paste made of barley-meal, mutton suet, and some treacle, or coarse sugar, mixed with milk, and are found to be completely ripe in a fortnight. If kept longer, the liver that

is induced by this continued state of repletion, renders them red and unsalable, and frequently kills them. In the eastern part of the county, many geese reared on the commons.

Pigeons in considerable numbers.

Bees, not very common. Sir William East, of Hallplace, a celebrated apiarist. In the forest district, bees are most common. One gentleman removes his hives to a heath at the flowering season.

Deer kept in several parks; 2500 fallow, and 300 red deer, in Windsor Great Park.

12. Political Economy.

Roads for the most part good, especially since a part has been put under the care of M^r. Adam. Gravel, flint, or chalk, abounds in most places. Canals and navigable rivers so interspersed, that no part of the county is further than twelve miles from water carriage. Cloth for sacking and hammocks, manufactured at Abingdon and Maidenhead, also some sail cloth, and rush, and twine matting. Cotton mills at Taplow.

Paper, and formerly blankets and other woollens, at Newbury. A parchment manufactory at Oakingham. At Reading, a pin manufactory, and the weaving of galoon, satin, ribbons, and other light fabrics; a floor cloth manufactory; twine and rope making; sail making, sacking, &c.

The Berkshire Agricultural Society, established in 1794.

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7006. GLOUCESTERSHIRE. A surface of nearly 800,000 acres, in three natural divisions; the Cotswold hills, the vale of the Severn, and the Forest Lands. Great part of the county is under meadows, pastures, and orchards; and cheese and cider are its known agricultural productions. It is also a manufacturing county, and its fine broad-cloths are celebrated, as well as its iron, tin-plates, and pins. There is no very eminent gentleman agriculturist, nor any agricultural society in the county, but Dr. Tennant farmed a small estate on the Chilterns. (Turner's Report, 1794. Rudge's Report, 1807. Marshall's Review, 1818. Smith's Geological Map, 1821.)

1. Geographical State and Circumstances.

Climate, cold and bleak on the Cotswold hills; mild in the vale, which lies open to the south winds; on the sandy soils of the forest district, the harvest is sometimes cut a fortnight earlier than in the vale.

Soil of the Cotswolds is all calcareous loam or stonebrash; in this vale, a fine black loam, or fertile red loam, and in some places a strong clay and peat earth; the finest soil is generally sandy loam, sand or peaty earth.

Minerals. None in the Cotswolds, but iron and coal in the Forest of Dean, both worked. Lead found in the limestone rocks of the lower part of the vale; not worked. Though iron ore is abundant in the Forest of Dean, only a small quantity is raised, it being found more profitable to bring the richer ore of Lancashire, which is burnt with the coke of the forest coal for cast iron, and plates for tinning. Coal pits numerous, and worked at a shallow depth, for want of proper machinery to exhaust the water; three sorts delivered, kitchen coal, smith's coal, and lime coal. Claystone and freestone found in various parts of the forest; paving stones, grimestones, yellow and grey stone tiles raised in different parts of the Cotswolds; gypsum is raised for stuccoing, and sent to Bath from Hambury; it is also used as alabaster for chimney pieces, &c.

Water. Produce of the Severn is roach, dace, bleak, flounders, eels, evers, charr, carp, trout, and pike. The sea-fish taken within the limits of the county, in the Severn, are salmon, lampreys, lampreys, chad, sole, shrimps, cod, plaice, conger-eel, porpoise, and sturgeon. Salmon formerly caught in great abundance, but now comparatively scarce. Great mischief done by the use of small meshed nets, which take the smelt or fry.

Ponds for water made on the Cotswold hills, as already described (4156.), in the vale in the common manner. The waters which rise through beds of blue clay, are often strongly saline, as at Cheltenham, &c.

2. Property.

Largest estate 30000. a year among the nobility, and 30000. among the gentry; tenures chiefly freehold, some copyhold, and about one-fortieth corporate or ecclesiastical. Estates under the see of Gloucester, leased out on lives; those of the corporation of the city, the same; usual fine for renewal of a life one year and a half of the improved annual value.

3. Buildings.

Many handsome seats; farm-houses and cottages on the Cotswolds built of freestone, and covered with stone tiles; often as many on an estate of 1000. a year, as are required for a farm of 5000. a year, under the correction of modern improvement; barns, however, of a moderate size; wheat stacked on stone stables. Cottages, as in most counties, neglected, and unworkable; some judicious remarks on the subject by Rudge.

4. Occupation.

Farms differ much in size; few exceed 10000. or fall short of 500. a year. Some grazing farms in the vale of 500 acres, but 200 and 300 more common. Leases of three years most common, next of seven years, not many of fourteen, and those of twenty-one on corporate property.

5. Implements.

A narrow-wheeled waggon in general use among farmers. Various ploughs; a short-beamed one-wheel plough in use on the Cotswolds; in the vale, a clumsy swing plough. Lambert's draining plough much in use with the improved draught apparatus (fig. 784.) and in the old way. Various improved ploughs and other implements, as well as threshing and winnowing machines introduced. A thisle drawer (fig. 254.) in use for extracting the corn thistle (*Serratula arvensis*) from corn fields; cradle scythe used for cutting beans.

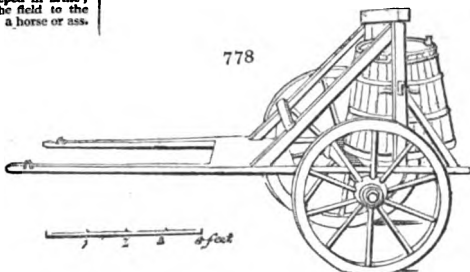
6. Enclosures.

The first enclosures during Queen Anne's reign; eleven during the reign of Geo. II.; and upwards of seventy during the reign of Geo. III. Hedges of white thorn, on which the reporter observes medlars might be grafted, and raised in great plenty. Black thorn (*Prunus spinosa*) hedges, he says, never suffer from the blight; a most erroneous idea.

7. Arable Land.

300,000 acres; much ploughing on the Cotswolds lightens the staple of the weak soils: seven horses often used in the vale teams; ridges in the vale so high that a person six feet high may stand in the furrows, and not be able to see the crown of the second ridge from him; to reduce them a small ridge often begun between them. Fallowing practised on the clays, then wheat and beans, or oats. Rotation on the Cotswolds — 1 turnips, 2 barley, 3 and 4 clover, mow the first year, 5 wheat, 6 oats, tares, or peas; if oats, frequently laid down with sainfoin. On crumbly soils wheat is sown and ploughed in during rather wet weather, otherwise the seedling plants are apt to be thrown out with the first frosts: the same thing attended to in Oxfordshire and various other counties; this is called seven-field husbandry. Beans either drilled or dibbled; a broad bean, the mazarin, used when the land is in good heart, and ticks when less so. The Hurbage pea, an early grey variety, most in use. "Some lands have the peculiar quality of raising *sidow peas*, or such as *bell freer*;" on them the Charlton is grown, and sold for splitting; clay lands never have this property. Tares common, and among these a sort called dill, supposed by Marshall to be the *erum hirsutum*, L., but erroneously termed antennum by Rudge. Turnips on the Cotswolds almost all of a broad-cast, and sometimes after wheat or tares, and then called stubble turnips; consumed by sheep in hurdle folds; sometimes given to horses, and found to induce them to eat barn chaff with a better appetite. Some flax

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raised; tessels a good deal cultivated formerly, now not 100 acres of them in the whole county.

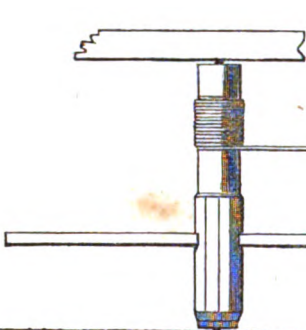
8. Grass.

Very rich meadows on the Severn, overflowed during winter and spring, on which the farmers depend for a crop. When the salt water overflows, the meadows are termed marshes, and grazed by horses and cattle that require rest and spring physic. In general meadows are mown and pastured alternately, excepting near Gloucester, where abundance of manure is obtained. Herbage, plants, and rye grass sown on the Cotswolds,

but little in the vale; *anthelm* much cultivated on the stone-brush soils. Green lands fed in general from May to the end of September, and then the cattle, unfinished, are taken in and completed with hay, oil-cake, and other artificial food, but seldom with roots. The orchard manure so common in the meadows, that it has been gathered, Rudge informs us, and made into sago. (5596.)

9. Gardens and Orchards.

Most of the cottages, such as they are, have gardens, and almost every farm its orchard; but large ones, so as to admit of



making cider for sale, are found only on the sides of the hills and in the vale and forest district. The stocks are planted in the orchard when six or seven feet high, ten or twelve yards asunder on pasture, and sixteen or seventeen on arable lands. A year after planting, they are grafted. Sometimes fruit trees are planted in the hedge rows; hedges are often composed of apple seedlings, raised from the kernels in the cider mast; and here and there the farmer often leaves a stem to rise above the general height of the hedge, and grafts it; frequently also windings are allowed here and there to rise into trees, and their fruit is used with that from grafted trees, in crushing for cider. Grafts are inserted in the cleft manner, at seven feet from the ground, two in each stock: if both succeed, one is removed the following spring, and the stock sloped to the remaining graft, to prevent the lodging of water, and chafed 'afresh, to facilitate the growth of bark over the wound. After graftings, "braids," that is, inverted wicker baskets, rising about two feet high, are fitted to the stock, which serve at once to guard the grafts, and direct their shoots to a proper form. The stock is next protected from cattle or the plough harness, by four posts placed round it, with six tier of rails; by three posts and six tier of rails; by two broad posts and rails; by a bundle of thorn branches; by planting a thorn or briar along with the stock; or by twisting a shoot of the creeping rose (*Rosa arvensis*) round the stock. The mode of planting a creeping rose with the stock, and twisting it round the stem, is said to be found the cheapest and best; but it must evidently impoverish the soil. Pruning is not attended to on young grafted trees, or any others as it ought to be, nor the removal of moss and mistletoe. Grafting the branches of old trees often practised with great success; a young stock grafted will probably not produce a bushel of apples in twenty years, but a branch grafted bears the second year. Dr. Cheston, of Gloucester, practises root grafting, but which is quite unsuitable for field orchards. Grafted trees bear little till twenty years of age; their produce increases till fifty years, and is then ten or fifteen bushels; an apple will bear 100 or more years from this period, and often much longer. A pear tree at Minsterworth 500 years old at least.

Cider-making. Best orchardists shake off the fruit, and never beat the tree, which destroys the blossom buds; limb by limb is shaken by a person in the tree, and those which adhere allowed to remain some time longer to ripen: the horse-mill used by large, and the hand-mill by small farmers; the cylinders of the hand-mill of wood, and fluted; sometimes there are two pair of cylinders, one finer fluted under the first pair, and in other cases the cylinders are set wide the last time the apples are passed through, and closer the second; the other processes as usual. Of the various apples grown, the white-stripe of the Forest district makes the strongest and richest cider; it is often valued equally with foreign wine, and sold at extravagant prices. Ciders from the Hagloe crab, golden pippin, and Longney russet, are next in esteem. The white-must, wood-cock, and half a dozen others, are fine old fruits, but now going off.

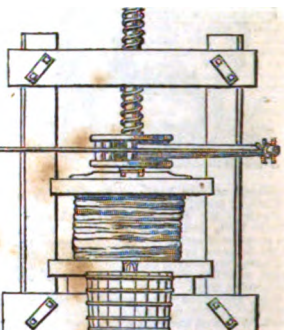
Perry from the squash pear is esteemed the best; and next from the Hulfcap and sack.

Table fruits, where farmers live near canals, pay much better than those of the cider kind; especially those of the keeping varieties, such as the golden and Moreland pippin, Longney russet, &c.

10. Woods and Plantations.

Most extensive on the Cotswolds; the sorts there beech and ash; timber sold to dealers who convert it on the spot to scantling for gun-stocks, saddle-trees, bedsteads, chairs, and other cabinet work, and staves for sugar bogheads. Some fine old specimens of chestnut, elm, oak, and ash in the vale. Tortworth chestnut, 500 years old, in the time of King John. In the Forest of Dean a considerable quantity of good timber belonging to government, and nearly 3000 acres lately planted with acorns. The method of planting is, first, to mark out the ground; then taking off about a foot square of turf, to set two or three acorns with a setting-pin; afterwards to invert the turf upon them, and, by way of raising a fence against hares and rabbits, to plant two or three strong white thorn setts round. They are seldom thinned till they have attained the

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size of hop-poles, and then are left at twelve feet distance from each other, with the view of again thinning them, by taking out every other one, when they are thirty years old, and have attained the size of five or six inches diameter. By growing thick, no side-shoots are thrown out, which supercedes the necessity of pruning; the young trees which are drawn at the first thinning, are transplanted, and, as it is thought, grow equally well with those that have not been removed, and produce timber as full at the heart, compact, strong, and durable, as "that which is raised immediately from the acorn." The "whitten," or small leaved lime (*Tilia cordata*, L.), is found in several coppices on the Welsh side of the Severn; and, what is singular, ropes for halvers, plough traces, cider presses, draw wells, and fishery boats, &c. are made from it as in Russia. These ropes are found to contract and expand less from moisture or drought than hempen ropes. The bark is stripped off about Midsummer, dried like hay in the sun, and manufactured on the spot or elsewhere. Many walnut trees in the parish of Arlington; the fruit shipped to distant places, and the timber sent to Birmingham for gun-stocks.

Artificial plantations, to a great extent, made round gentlemen's seats on the Cotswold hills. The osier in beds on the Severn.

11. Improvements.

On the lands adjoining the Severn inundations were frequent; but a commission of sewers have erected banks and flood-gates, which protect upwards of 12,000 acres. At other places private banks or flood-gates on the rivers or banked ditches are placed, and operate by the alternate influence of the tides and accumulated inland waters.

Draining much practised; both in the turf, stone, wood, straw, and with Lumber's plough; the plough drawn by twelve horses, or worked by a long lever and axle (2534.), by which one horse gains the power of thirty. Before the mole draining-plough is used, it is a good practice to turn off the sward with the common plough; then to make the incision for the drain in the centre of this; the sward being afterwards turned back to its place, completely covers the aperture, and protects it from the effects of a subsequent dry season. The long-continued drought of the summer of 1806 opened many drains which were cut by Lumber's plough, so much that the bottom was clearly seen; while many that have been done by hand have formed still wider chasms, and will probably not answer the purpose intended at all. In both instances there is reason to think, that this would not have happened if the operation had been performed in autumn, and the surface turf first turned back, as recommended.

The accumulated water of underground drains raised from low meadows in one parish by a wheel driven by the water of surface ditches.

Paring and burning practised on the Cotswolds; weeding corn general.

Irrigation chiefly pursued in the valleys of the Cotswolds, adjoining rivulets, and especially the Coln and Churn. Carried to greatest perfection in the parish of South Cerney; first begun here under the Rev. W. Wright, who wrote several tracts on the subject. When the first great rains in November bring the waters down in a muddy state, it is let into the meadows. In December and January the land is kept sheltered by the waters from the severity of frosty nights; but every ten days, or thereabouts, the water is let entirely off, to give air and prevent the roots from rotting. In February great care is required. If the water now remains long on the meadows, a white scum will generate, which is found to be very injurious to the grass. On the other hand, if it be taken off, and the land exposed to a severe frosty night, without being previously dried for a whole day, much of the tender grass will be cut off. Towards the middle of this month less water is used than before, keeping the land rather wet than watered. At the beginning of March, there is generally in such meadows plenty of pasture for all kinds of stock; the water, however, should be taken off nearly a week before cattle are turned on, and a little hay at night during the first week is very proper. It is the custom, with some to spring-feed, with oats and lamb folded, with a little hay. The meadows, however, must be en-

finely clear of stock by the latter end of April. If May be at all intruded on, the hay crop will be much injured, and the grass become soft and woolly, like lathemath. After spring-feeding the water is let in again for a few days. It is remarked, that autumnal, winter, and spring watering will not occasion rot in sheep; but if the water be used for a few days in any of the summer months, the pasture becomes unsuitable for such stock. This is conformable to the general idea of rot; viz. that it is occasioned by summer moisture, and is seldom known to any considerable extent without a long continuance of warmth and rain. A wet summer, therefore, is always productive of this disease in the vale. The general advantages of watering are, that the land and herbage are continually improving, without manure; and the crop is not only full and certain, but also early.

Warping might be practised to a considerable extent on the banks of the Severn, if the commissioners were to direct their attention to the subject.

12. Live Stock.

The dairy the principal object with most of the vale farmers. Good milkers preferred, without much regard to perfection of shape. Gloucestershire breed resembles the Glamorganshire excepting in color, which is red or brown, both the horns of middling length, white with a black tip at the ends, under thin in flesh and large. In the higher vale the improved long horned cows of Bakewell and Fowler in most repute. Devons, Herefords, and various others in use. The best land does not always produce the most marketable cheese; often times the reverse; if it has either been much manured with dung, or sheep feeding, the quantity of milk will be increased, but the quality materially altered. This is probably owing to the introduction of plants, which did not grow there before, or to the destruction of some that did. The cause does not originate with the cow, but the herbage on which she feeds. The same cow, on two pastures, separated only by a hedge, will give milk of different qualities: from one shall be made fine, rich, and close cheese; while from the other shall be made rank, "heaving," hollow, unpleasant to the palate, and unfit for the market. In the parish of Haresfield, two grounds adjoining each other were alternately used for the pasture of cows: while they were on one, excellent cheese was made; but on the other, it was difficult to make any tolerably good. The latter had been lately well dressed with manure, which produced plants unfavorable to the dairy; and the dairy woman herself remarked, that if the farmer continued to enrich the herbage with dung, she must give up making cheese. It is

proper, therefore, that milking-cows should not be removed from one pasture to another indiscriminately, but that certain grounds, in proportion to the stock, should be assigned to their use; and this is the practice on many farms, where cow pastures have for time immemorial been appropriated exclusively to the use of the dairy. The dung of the cow, indeed, being of a cooling nature, is the best manure for cow-pastures. Other animals, such as colts and sheep, may occasionally be let in to eat the refuse grass, but not more than one sheep should be allowed to an acre. Among the plants which are useless, or unfavorable to the making of good cheese, are white clover (*Trifolium repens*), the different kinds of crows-foot (*Ranunculus*), and garlic (*Allium*). White clover is brought forward by manure and sheep stock, and is a proof of good land, at least of land in a state of high cultivation; hence it has a tendency to raise the quality of the milk, and make the cheese better.

Cheese-making. Best cheese not attempted while the cows are on hay; generally commences about May, when the cows are turned into the pastures. Cows milked twice a day, at four in the morning, and at the same hour in the afternoon; the cheese-factor discovers the "hovey" cheeses by treading on them.

Sheep. Principal breed the Cotswolds; now very much mixed by crosses with the Leicester and South Downs. The liver rot common in the vale, and therefore few bred there. Wiltshires are bought in and fed off.

Horses no particular breed.

Pigeons, formerly numerous, now on the decrease.

13. Political Economy.

On the hilly districts, where stone abounds, the roads greatly improved of late; those under Mr. Adam excellent; but the vale roads in many places very bad. Manufacture of woollen broad-cloths, chiefly superfine from Spanish wool, extensively carried on in the district called the Bottoms. Carpet weaving and thin stuffs at Cirencester; stocking frame knitting at Tewkesbury; wire, cards, rugs, blankets, iron and brass wire, tin plate, pins, writing paper, felt hats, manufactured at different places. Spinning of flax the winter work of women in the vale of Evesham. Extensive iron works in the forest; the best iron in the kingdom made at Huxley; nails made at Littledean. Articles of agricultural commerce, cheese, bacon, cider, perry, grain, and salmon, to the extent of 40000. per annum; in manufacturing commerce, broad-cloths and pins are of the greatest importance.

7007. WORCESTERSHIRE. A surface of 500,000 acres, distinguished by the two extensive vales of Worcester and Evesham. In the fertility of its soil, and the amenity of its situation, surface, and natural embellishments, very few districts of similar extent are equal to it—scarcely one excels it. And its agricultural products are not only more abundant, but more various, than those of other counties; not corn, cattle, and dairy produce only, but fruits, liquors, and hops, rank among its productions. (*Pomeroy's Worcestershire*, 1794. *Phil's Report*, 1807. *Marshall's Review*, 1818.)

1. Geographical State and Circumstances.

Climate. Of the middle, south, and west of the county, remarkably mild, soft, and salubrious; the vales of the Severn, Avon, and Teme, with the contiguous uplands, rising to 150 feet above their level, ripen their products from a first degree to a month earlier than what take place in elevated countries even with a similar soil and surface; sixty yards perpendicular = one degree more to the north; conformably to this idea, early at Worcester, and late at Birmingham. Apparently much less rain falls here, than in countries more elevated, and more toward.

Soil. Ten thousand acres of deep rich sediment deposited by the Severn, and a good deal of the Avon, Teme, and Stour; half the rest of the county, rich clay and loam; some light sandy soils about Kidderminster, and springy gravel about Bromsgrove.

Minerals. Brick-clay, gravel, sand, marl, freestone, coal, at Marnie; quarterns, a siliceous stone, forms the basis of the Malvern hills. Excellent common salt at Droitwich.

Water. Rivers, but no lake, pool, or pond formed by nature. Malvern well, a good chalybeate; it is limpid, without smell or taste.

Fish in the Severn, salmon, shad, lamprey, and lampurn; the lampurn grows to twenty-six inches long, and is often three or four pounds weight; it leaves the sea in the spring, and is esteemed a great delicacy, but unwholesome when eaten too freely. The lampurn goes to the sea at certain seasons; is ten or twelve inches long, about the size of a man's finger, and common in Worcester, potted or preserved; vast quantities sold for baits to the cod fishery.

2. Property.

Variouly divided among all classes; many resident families of considerable opulence and fortune.

3. Buildings.

Some magnificent residences; farm-houses erected at different times, and no way remarkable, unless for being badly situated and arranged; great want of sheds for cattle. Cottages have nothing to recommend them; often built of timber and plaster, and covered with thatch. Some good stone bridges over the river, one of one arch, 150 feet span and fifty feet rise, at Stourport.

4. Occupation.

Farms small, from 400. to 4000. a year, but some larger; seldom held on lease; but when a tenant takes a farm on strong lands, where the course is fallow and three crops, he holds it by custom for four years. Knight of Lea Castle, farms 330 acres in a masterly style; large farmers have a turn for improvement; small ones have seldom an opportunity; many inventions proposed and introduced, and the sensible farmer unfortunately finds few of them that will answer.

Picturesque farming by Knight. About 300 acres around Lea Castle, formerly in irregular uncouth divisions, with wide slovenly hedges, are now laid, or laying together, the roads better disposed both for convenience and appearance, and the hedges stocked up; but the trees, which are in abundance, carefully preserved, to give a park-like appearance; this is divided into lots by irregular hedges.

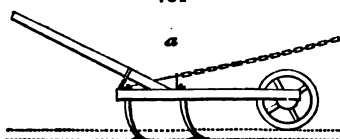
Military farming. The same gentleman, when the volunteer cavalry were raised, sold his heavy farm, and

bought light ones, chiefly Cleveland, on which he mounted ten of his own servants for military service. The horses found all the farm work, and occasionally serving for saddle horses, or to draw his carriage.

5. Implements.

Plough two-wheeled, and drawn by three horses in a line, walking in the furrow; in the vale of Evesham, a heavy swing plough; these ploughs are seen no where else; they are all shaft, excepting the share and coulter; very long in the tail, short, and shroud; a long for a team; the four-wheeled trolley is a low waggon used for harvest work. Knight uses improved implements, and ploughs with two horses a breast. Various drills for sowing wheat, and stirring the soil between the rows (*fig. 781.*), manufactured at Evesham, and used in the neighborhood.

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6. Arable Land.

Fallows ploughed four times, which is rather rare in England; rotations generally a fallow and two corn crops, with an intervening leguminous herbage, or turnip crop. Drilling in use for wheat, in the vale of Evesham and other places; beans commonly dibbled. Turnips cultivated broad-cast, and Carpenters, author of *A Treatise on Practical and Experimental Agriculture*, has discovered since he published his book, that the fly is to be prevented or destroyed by steeping the seed in sulphur before sown, and harrowing as soon as the fly is discovered, "then sow eight bushels per acre, of dry lime, or fine ashes, when the dew is on the leaves, so as it may adhere to them." Carrots sown by Knight and others in the neighborhood, where a good deal of seed is raised for the London seedmen.

Hops grown to great perfection, and fruit trees generally planted among them at the rate of forty-eight to an acre; 1000 stools of hops are considered an acre, whatever ground they may stand on, and labor is paid for accordingly. Golding-vine, mathon-white, red, nonpareil, and Kentish grape, local names for varieties distinguished by very slender shades. Land stirred between the plants with the plough; only two poles to a stool; picking chiefly by Welsh women. When tithe of hops is taken in kind, the parson may either take every tenth basket when green, or every tenth sack when dried; in the latter case, allowing 25s. per cwt. for drying, picking, and duty. The culture of hops having been carried too far, the trade here, as elsewhere, is on the decline; corn, on the average of years, is found to pay better.

Asparagus, cucumbers, and onions, grown in the fields of

Evesham, and sent to Birmingham Market, though thirty miles distant; also, poppy-heads for the London druggists. Clover for seed in various parts of the county.

7. Grass.

The banks of the rivers chiefly under meadow of the very richest kind; employed chiefly in fattening cattle and sheep; clovers and rye grass cultivated.

8. Gardens and Orchards.

Market gardens near most of the principal towns; produce, besides local consumption, is sent to Bath, Bristol, and Birmingham. Orchards, long and successfully cultivated in the middle, south, and western parts of the county; round towns, villages, and farm-houses; and all the hedge-rows of a farm often planted with fruit trees, and very productive. In a plentiful year, or what is called a "bit of fruit," it will not pay for carriage to market from remote places; no casks can be got for all the juice. In 1784, cisterns were formed in the ground to receive the liquor, but they ran out; in Pershore, it is said currents of perry ran in the common sewers. Large quantities of apples rot, or are devoured by hogs; cider in such a year sold for 21s. a hoghead, in Worcester market; two or three tons of cherries often sold in Worcester market in the morning before five o'clock; six tons have been sold there in one morning; 2000l. has been paid for the tonnage of fruit on the Trent and Severn canal in one year; canal forty-six miles long, tonnage 14d. per ton per mile; 7000 tons must therefore have passed. The stocks are not grafted here till three years after planting out, and saddle-grafting of a peculiar kind, (fig. 782.) is preferred to the cleft method in Gloucestershire. Sometimes the boughs of the stock are each grafted in the whip manner. When cleft-grafting is performed, the cleft is made with a saw, and afterwards smoothed with a knife; little care paid to the trees afterwards; they bear at five years, are at perfection at thirty, and continue in full bearing for at least thirty years more. Sheep should be excluded from the orchards, and coarse grass or straw burned in them on the first appearance of a blight; this fumigation destroys myriads of insects. Fruit is gathered as it falls from the tree; no force used till the leaves are mostly fallen, and then only shaking or striking with a light pole. Cider made only of fruit, or its previous sweet and clean state. Pomey proposes to separate the core and kernels from the pulp, by forcing a cutting through each apple, and then grating the core and pulp apart, as much of the flavor of cider depends on bruising the seeds.

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9. Woods and Plantations.

Abundance of oak and elm. Croome, Hagley, &c. well-wooded. Forest of Wire, near Bewdley, supplies oak poles, rails, hurdles, laths, hoops, &c.

10. Improvements.

Earl of Coventry drains his park by open cuts wide, and their sides turfed to the bottom; all the attention they require is preventing the establishment of large weeds, or coarse tufts of grass, which would interrupt the water; some embankments on the Severn, and some meadows irrigated, but mostly by floods.

7008. MONMOUTHSHIRE. A surface of 316,800 acres varied by hills, some of which are of considerable height; more distinguished by its woods and its mineral products than its agriculture. A part of the coal basin of South Wales a fund of wealth of immense consequence to Britain, extends into Monmouthshire, and, with the iron works, forms an important source of industry and wealth. (Hasall's Report, 1811.)

1. Geographical State and Circumstances.

Climate. Mild in the vales and cold on the confines of Breconshire, where the snow sometimes remain on the ground till a late period in spring; atmosphere humid, as in most western counties; highly favorable to the growth of grass.

Soil. Clay, loam, and grey soil on rock or marble, and beds of limestone. Caldicot and Wentlog levels on the Severn; under the court of sewers is a rich silty loam. Soil of the hills a reddish loam. No peat, and but little scattered.

Minerals. Coal, iron, and lime. Upwards of twenty iron works in the coal district; coal not brought into general use till 1792, when the canals and railroads were completed. Principal proprietors of the mineral district, Sir Chas. Morgan, C. Leigh, Esq., B. Hall, Esq., and the Earl of Abergavenny. A particular description of the mineral basin of South Wales given by Martin (Phil. Trans. 1806).

2. Property.

Duke of Beaufort and Sir Chas. Morgan the chief proprietors; next class, 1000l. to 3000l. a year; a third class, 300l. to 1000l. a year. Many proprietors occupy a part of their estates, and cultivate them well; some very small proprietors of orchards and grass lands.

3. Buildings.

Some fine old seats; farm-houses of the oldest date, timber thatched; new ones covered with tile-stone; seldom any farm yards; but cattle-houses and barns scattered about at random; cottages on the most frugal plan, generally with a garden.

4. Occupation.

Size of farms, sixty to 300 acres; 110 acres about the average; leases not very general.

11. Live Stock.

No particular breeds; land too good for breeding; feeding chiefly attended to, and some dairying; some selling, and a good deal of oil-oake used for finishing autumn-fed oxen. Mules used in agriculture in some parts of the county, especially near Bewdley; rise to fifteen hands, or more. Sheeps carriage mules bred from grey or white mares and a white spotted foreign sire. The great age to which they attain is one of their chief advantages; at perfection at thirty, and work till seventy or upwards. Asses employed by Carpenter, of Bromsgrove, farmer and author.

12. Political Economy.

Principal roads good; cross-roads very bad. A road club, established in the vale of Evesham in 1792, the members of which bind themselves to become road surveyors, gratis, in their turns, and strictly to enforce all laws, and to take all the means in their power for procuring and keeping good roads: several canals, fairs, and markets. Manufactures of gloves in Worcester, and also of porcelain and cabinet furniture: of woollen cloth and glass at Stourbridge; of glass and pottery at Dudley; leather-making from sheep skins at the same place; nails, needles, linen, wool-combing and spinning at Bromsgrove and Redditch; tanning in most places; carpets at Kidderminster; various iron works on the Stour; stocking frames at Tewkesbury and Bredon.

Droitwich salt works on record from 816. The strata over the salt are, mould five feet, marl thirty-five feet, tale, a gypsum or alabaster, forty feet, then a reservoir of brine twenty-two inches, then tale seventy-five feet, then a rock of salt, into which the workmen bored five feet. The brine is inexhaustible; on boring through the tale, it immediately rises and fills the pit. Salt had been sold in one year, from April 5, 1771, to April 5, 1772, 601,579 bushels; of which exported abroad, 110,120 bushels. Duty paid into the salt-office, London, 61,457l. which was then nearly one-third of the whole revenue from salt in England. The process of making salt at Droitwich is as follows:—A little common water is first put into the pan, to keep the brine from burning to the bottom; the pan is then filled with brine, and a small piece of resin thrown in to make it granulate fine; when the brine is boiling, the salt first incrusts at the top, and then subsides to the bottom; when subsided, the persons employed ladle it out with an iron skimmer, and put it into wicker barrows, each containing about half a bushel, in the shape of a sugar loaf, and let them stand at the side of the pan for some minutes to drain; they then drop the salt out of the barrow, and place it in the stove to harden. In 1775, Baker, a druggist, from London, spent 12,000l. in a project for conveying the Droitwich brine in pipes to the Severn, without success. Dr. Nash, from experiment, believes Droitwich salt to be neither manure in itself, nor capable of exciting any vegetative principle on the earth, as animal or vegetable salts, or lime may do; it produces bad effects on ploughed lands, by increasing their dryness in hot weather, and by making them greasy; and what the farmers call raw, in damp weather. He has found it serviceable to scatter foul salt upon large heaps of manure, to kill weeds and destroy their seeds, but not to enrich; care must be taken that it be not laid near the roots of the trees, as it will certainly destroy them. If laid at the bottom of pools, it enables them to hold water; it is wholesome to granivorous and graminivorous animals, but prejudicial to carnivorous ones.

13. Means of Improvement.

The establishment of village and parish libraries recommended; and a paper on the subject copied, which appeared in the Worcester newspaper. From the books recommended, as well as other evidence, the writer of this paper is Sir Richard Phillips. The plan is excellent, and would probably, in the course of a generation, effect a complete change in the lower classes of society. Le Couteur's treatise on apple trees and cider, as applicable to the Lake of Jersey, appended to the survey.

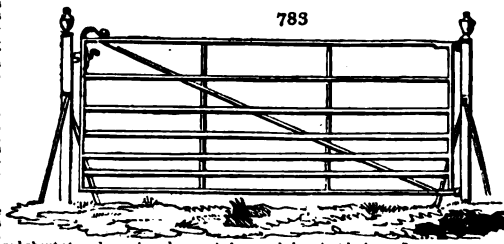
5. Implements.

The proprietors of iron works have introduced many improvements from the north; very neat iron gates and posts. (Fig. 783.)

6. Arable Land.

Less than the pasture; tillage chiefly by oxen. "Many farmers are so circumstanced, as to be ever on the watch, lest the avance of their landlords should interfere with their industry, by taking advantage of any improvement of the man in the soil, and unexpectedly raise the rent. That such unfair dealing is become too frequent, is much to be lamented, and can only be guarded against by leases."

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and can only be guarded against by leases."

7. Grass Land.

"Some farmers insist on it that rushes shelter and protect grass, and will not allow them to be removed by draining or otherwise."

8. Gardens and Orchards.

The latter, general on a small scale; apples for eating much in demand at the iron mills; best orchards and hop-grounds in the hundred of Ragland.

9. Woods and Plantations.

County long famous for the size of its oaks; stock now much diminished.

10. Live Stock.

Mixed cattle; some dairying, but feeding more general; Hereford horses a good deal bred; asses and mules in use about the iron works: the mules found better than horses for carrying charcoal from the woods to the iron works.

7009. HEREFORDSHIRE. A surface of 600,000 acres, studded with hills, hillocks, and minor swells of various heights and dimensions; almost every where of a rich soil, devoted exclusively to agriculture, and highly productive in corn, cattle, fruit, cider, hops, and timber. The most distinguished cultivator in the county is T. A. Knight, Esq., known in agriculture by his Treatise on the Apple and Pear, many valuable papers in the Transactions of the Royal Society, and communications to the Board of Agriculture; and in gardening by numerous essays and improvements, and his honorable office of President of the Horticultural Society. (*Clark's Herefordshire*, 1794. *Duncomb's Report*, 1808. *Marshall's Review*, 1818.)

1. Geographical State and Circumstances.

Climate, remarkable healthy; west winds the coldest; warmest and earliest part about Ross.

Soil. A marly clay of great fertility extends over most of the county. The heaviest crops of wheat produced on a clayey tract between Hereford and Ledbury; the lightest lands in the south-east about Vernemore, and known as the "Rye lands," from the prevailing produce there in former times.

Minerals. Iron ore in the sandy district, but none manufactured at present. Red and yellow ochres, pipe-clay, and fullers earth, but only the latter worked for

Water abounds; salmon caught in the Wyre, but owing to the weirs and illegal practices, not so abundantly as formerly.

2. Property.

Guy's Hospital, Duke of Norfolk, Earl of Oxford, Earl of Essex, Sir G. Cornwall, &c. the largest proprietors. Their estates divided into farms of from 800 to 400 acres. A number of estates from 400 to 1000, per annum constantly resided on by their owners, and cultivated and managed in good style, with a view to the introduction of the best agricultural practices. The tenures of gavelkind and borough-english exist in a few places, but are generally nullified by will.

3. Buildings.

Some fine seats of proprietors, as Home-lacy, Hampton Court, Downton Castle, &c. Old farm-houses of wood, well designed, and placid: some good new ones on the Guy's Hospital and other estates. Cottages very humble, and of an inferior construction. Strawberries lately cultivated by some cottagers, for the Hereford market, with success and profit.

4. Occupation.

Small farms on the decline: few opportunities now by which an industrious couple can devote 50*l.* or 100*l.*, acquired by personal labor, to stock a few acres, and bring up their family, and pass their latter years in comparative independence. Hence matrimony on the decline, and licentiousness on the increase. Hence Duncombe humbly recommends proprietors to forego the temporary advantages of throwing the whole of their estates into large farms, and advises some of all sizes, from 5 to 500 acres, as ultimately best for the country.

"The old-fashioned farmer of Herefordshire receives any new experiment in agriculture with great hesitation, if not reluctance. When its utility is confirmed by repeated trials, he slowly and gradually falls into the practice; but he wisely leaves the experiment and the risk to those who recommend or suggest it; and happily the county is at this moment well provided with agriculturists, who possess the means and the spirit to undertake the patriotic task. Less than twenty-one years most commonly in three periods of seven years, determinable at the end of each period by either landlord or tenant."

5. Implements.

Plough called the light lammas, without a wheel, and drawn by three or four oxen generally in a line, abreast, but often the yoke is the usual mode of harnessing. Various improved implements by the amateurs, but none in general use.

6. Arable Land.

Wheat principal grain cultivated, and generally sown on a fallow. Change of seed procured from the chalk hills of Oxfordshire; steeped in brine and lime, to guard against vermin and smut. Knight, late of Elton, now of Downton Castle, sows in water and then envelops in lime, and his wheat was as free from smut and other diseases as that of his neighbors from changed seed. Hops a good deal cultivated, and chiefly disposed of to Bristol dealers.

7. Grass.

Fertile meadows on the Wyre, Frome, and Lug; mown and fed. Not a dairy county for home consumption, seldom for exterior markets, or Smithfield. Butter supplied from Wales, and cheese from Shropshire and Gloucestershire. "The general soil of Herefordshire appears to be unfavorable to the making of cheese. T. A. Knight, with that accuracy and skill which he is known to possess on all subjects connected with agriculture and natural history, has proved by experiment, that equal quantities of milk in Herefordshire and Cheshire, will produce unequal quantities of curd, highly to the advantage of Cheshire; and further, that better cheese has been produced in that county, from milk, half of which has been previously skimmed, than is produced in this from milk altogether unskimmed. The want, therefore, of complete success in this valuable branch of rural economy is not solely to be attributed to the want of skill in our dairy-maids; and the cause of failure is rendered more difficult of discovery, and consequently more difficult to be remedied, from an observation that the plants were nearly the same in the Herefordshire and Cheshire pastures, on which the above experiments were made: white clover abounded in each, with the crested dog-tail grass and ryegrass mixed with others in small quantities. Of such plants the pastures of Herefordshire are generally composed.

A mode of managing sound meadows and pastures has lately been tried, and attended with a great increase of produce.

11. Political Economy.

Valentine Morris, Esq., of Hereford, being examined as to the roads of the county, before Parliament, was asked,—

Q. What sort of roads have you in Monmouthshire?

A. None.

Q. How do you travel then?

A. In a ditch. "This was thirty years ago; they are now improved, but still bad; various iron railways and canals."

12. Means of Improvement.

Leases; embanking the river meadows; drainage; knowledge.

The grass is mown as soon as it is in blossom, and consequently previous to the formation of seed. The after-grass is not grazed until it begins to contract a yellow appearance, in the latter end of October or beginning of November. In this case the ground remains covered during the winter with a portion of dead herbage, through which the young grass springs with the greatest vigor at an early period of the succeeding spring.

8. Gardens and Orchards.

Fruit trees first extensively planted in Herefordshire in the time of Charles I., by Lord Scudamore, of Home Lacy. Orchards and hedge-row trees of the apple and pear kind are found on every aspect, soil, and under every culture. The soil best adapted to most kinds of apples, is a deep rich loam when under the culture of the plough; the Styre and golden-pippin, in particular, form exceptions, and flourish most in a hot and shallow soil, on a lime or sandstone. The best sorts of pear trees also flourish in the rich loam, but inferior kinds will even flourish where the soil will scarcely produce herbage. The apples are divided into old and new sorts; each class comprises some called kernel fruits, namely, the fruit growing on its native roots, as a distinction from those produced by the operation of grafting. The old sorts of apples are those which have been long introduced, such as the Styre, golden pippin, hagloe-crab; several varieties of the Harvey; the brandy apple, red-streak, woodcock, moyle, gemnet, red, white, and yellow musks; fox whelp, loan, and old pearmain; dymock red, ten commandments, and others. Some of these names are descriptive of the fruit, and others are derived from the places where they have been first found, or found in most abundance. The old pears held in most estimation are, the squash, so called from the tenderness of its pulp; the oldfield, from having grown on a seedling in a field of first name; the hutpinn, from the quantity of fixed air contained in its liquor; the bar-land, from fields in the parish of Rosbury, called the Barlands; the sack-pear, from its richness; and the red pear, from its color. Of more common sorts, the long-land is the most valuable, and for the general use of the farmer perhaps the best of any.

9. Woods and Plantations.

Oak woods, abundant, and more rapid in its growth in this county and Monmouthshire than in most parts of England. Lord Oxford's estates and Croft Castle contain the finest old trees in the county; fine woods at Foxley, U. Price, Esq.; most inlaid oak timber and coppices at Moccas Court, and Stoke Park, a curious weeping oak at Moccas. Most productive ash coppices at Hampton Court and Ledbury; cut every thirteen years for crate ware, hurdles, &c. and bring from 18*l.* to 25*l.* per wood acre, which is to the statute acre as 8 to 5. Elm trees are interspersed in the hedge-rows with fruit trees.

10. Improvements.

Draining much wanted, but practised chiefly by proprietors; watering little practised, though introduced in 1610 by R. Vaughan, Esq. of New Court, whose tract on the subject has been already mentioned, (4054.) One of the greatest experiments in this way which has been attempted of late years in Herefordshire, has been attended with complete success on the estate of T. A. Knight. By making a weir on the river Teme, with proper courses for the water, that gentleman is now enabled to irrigate two hundred acres of land, which were never watered before, with the assistance of the least flood; and one half of that quantity even in the driest season.

11. Live Stock.

Hereford cattle esteemed superior to most, if not to all, other breeds; those of Devon and Sussex nearest them in appearance. Large size, an athletic form, and unusual neatness, characterize the true sort; the prevailing color is a reddish brown, with white faces. The rearing of oxen for agricultural purposes universally prevails; nearly half the ploughing is performed by them, and they take an equal share in the labors of the harvest. They are shod with iron in situations which frequently require their exertions on hard roads. The show of oxen in thriving condition at the Michaelmas fair in Hereford, cannot be exceeded by any similar annual collection in England; on this occasion they are generally sold to the principal graziers in the counties near the metropolis, and there perfected for the London markets.

Herefordshire not being a dairying county, breeders direct their attention to producing that form of animal best adapted for feeding rather than milking. "The whole attention of the Herefordshire breeder has been directed to the improvement of his cow; and for the use of the grazier, he has made her an excellent animal. The Herefordshire breeder, on the contrary, has sacrificed the qualities of the cow to those of the ox; he does not value his cow according to the price which the good world will give for it, but he prizes her as it possesses that form and character which experience has taught him to be conducive to the excellence of the future ox. Hence the cow of Herefordshire is comparatively small, extremely delicate, and very feminine in its characters. It is light-fleshed when in common condition, but capable of extending its univer-

sally in a short space of time, when fattening. Experience seems fully to have proved, that these qualities in the cow are necessary to perfection in the ox; and that when the cow is large and masculine in its character, and heavily loaded with flesh, the ox will be coarse and brawny, and, consequently, unkind and tedious in the process of fattening. It may here be remarked, that there is an extraordinary difference between the weight of a Herefordshire cow and the ox bred from her; perhaps other sorts, eminent for producing fine oxen, are similarly distinguished; but it is a fact, that a Herefordshire cow will not unfrequently be the mother of an ox of nearly three times her own weight. T. A. Knight, who made this observation, recollects no instance of this great disproportion in the weight of the males and females of the long-horned cattle. That gentleman farther observes, that he is unable to discover what advantage the public have derived, or are likely to derive, from a breed of cattle which are neither calculated for the dairy nor for breeding oxen. The difference in the dairy between a good and an indifferent milking cow on the pasture which is adequate to the keep of the latter, will seldom exceed five pounds, and if the animal be good, a very poor pasture will be sufficient; but the difference between a good and bad ox will often exceed twenty pounds, where both have consumed in fattening equal quantities of food: individuals and the public are, therefore, equally and evidently interested in the improvement of the laboring ox. Persons of little experience, Knight adds, in the breeding of cattle, may perhaps think that a sort is obtainable which will unite the two objects; but experience will convince them, that in endeavoring to approach two opposite points at the same time, they will never be able to reach either. Where the soil is well calculated for the dairy, every attention should be paid to obtain and improve the best sorts of milking cows; and where the ox is kept to a proper use as a beast of draught, nothing conducing to his excellence ought to be neglected. A cow

must, however, give milk enough to keep its calf fat, or it is disqualified for breeding a good ox, because the calf would be spoiled before it had acquired the proper age to be weaned.

Sheep. The provincial breed, the Ryeland, named from the sandy district in the neighborhood of Ross. They lamb in February and March; but during winter, and particularly in time of lambing, the store flocks are generally confined by night in a covered building, provincially termed a cot, in which they are sometimes fed with hay and barley straw, but much more frequently with peas-haulm. Some breeders accustom them to the cot only in very severe weather, and in lambing time. The practice was derived from the Flemings, and introduced into England about the year 1660. A cross has been made between the Ryelands and the new Leicester sorts, to the advantage, perhaps, of the breeder who is situated on good land, but certainly to the detriment of the wool. A cross between the Ryeland and real Spanish seems the most probable mode of adding, to its fineness and value. Dr. Parry's experiments have been already related. (6490.)

12. Rural Economy.

"If a certain proportion between the price of labor and the average price of wheat, could be fixed by law, so as to render the applications for parochial aid necessary only in cases of a very large family, of unusual illness, of scanty seasons, or any other real emergency; the measure, it is presumed, would be honorable to the country, would stimulate industry and fidelity, would check dishonesty, and endear to a numerous class their native soil."

13. Political Economy.

Roads formerly bad; now improving; materials, coarse limestone. Gloves, to a small extent, manured in Hereford. An agricultural society established in 1797, which has given many premiums, and done much good.

7010. SHROPSHIRE. A surface of 890,000 acres; in general flat, but with hills of considerable height on some of its margins. The soil is chiefly clay, but in part light turnip land; both are devoted to the raising of corn-crops. Breeding and dairying is also practised to a moderate extent. The greatest improver in the county is the Marquess of Stafford, whose extensive and important operations on the estate of Lilleshall are described at length by Loch, in his *Improvements on the Marquess of Stafford's Estate*, 1819. (*Bishop's Shropshire*, 1794. *Plymley's Shropshire*, 1801. *Marshall's Review*, 1819.)

1. Geographical State and Circumstances.

Climate. Considerable difference according to the soil and surface; more warm on the eastern side than in the middle of the county. E. winds prevail in spring, and W. in autumn.

Soil. Nearly an equal quantity of wheat and turnip land, the former rather predominant. S.W. side of the county variable; thin soil upon clay or rock; extensive tracts of hills and waste; and most sorts of soils except chalk and flint.

Minerals. Lead in granulated quartz very productive. Copper are found but not worked. Coal of excellent quality on the eastern side of the county: lime, building-stone, chert, bones, and spa waters, at different places. At Kinley Wick a spring of salt water, used for making soda at a work established at Wornbridge.

Waters. Twenty-two sorts of fish found in the Severn in Shropshire. Salmon in season from Michaelmas to May.

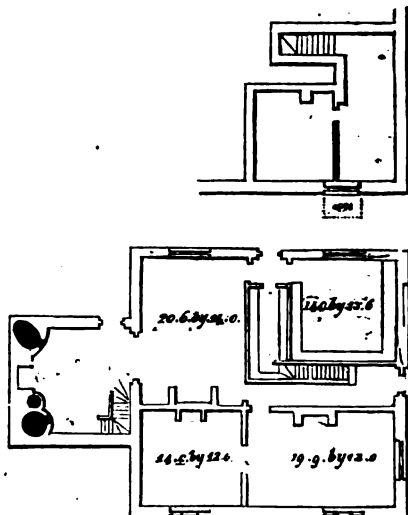
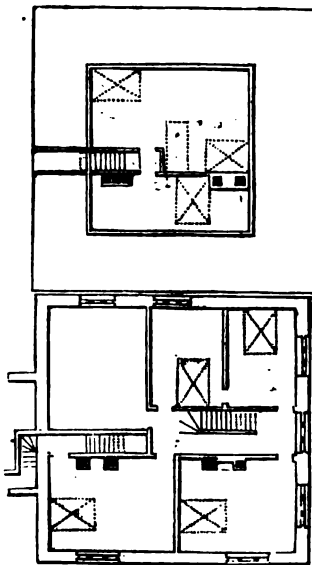
2. Property.

Estates of from 10 to 25,000 acres, and an infinite number of freeholders; yeomanry estates of all inferior sizes: much copyhold, but the lords upon some customary manors have enfranchised the copyholders upon receiving an equivalent in money.

3. Buildings.

Some good new mansions; above eighty of these named in old maps become farm houses. Farm houses generally in villages. Excellent new ones on the Marquess of Stafford's estates. (Ag. 764.)

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Comfortable cottage with gardens much wanted. Some judicious observations by Plymley; prescribe no particular forms, but suggests the impropriety of making them, or indeed any other object, bear an outward appearance, intended to contradict their inward use; all castellated or gothicized cottages, all chateaulike houses, or forbidding palaces, he conceives to be objectionable. They are intended to deceive, and they

tell you that they are intended to deceive. It is not pleasant to encourage any thing like deceit, but in these instances imposition effected is rarely gained; it amounts only to imposition attempted; or, could the deceit succeed, it would only present a prospect with fewer properties about it than there really are. Almost every species of country building has a good effect, if properly placed and neatly executed; and what are

the least ornamental, or indeed the most disgusting, of their appendages, cease to shock, when supported by the relative situation they stand in, showing their necessity and their use. A dunghill in a farm-yard creates no disagreeable idea; but connected with a public gateway, or embellished tower, it is bad. Cattle protected by the side of a barn, form a picturesque group; but sheltering under a Grecian portico—the impropriety is glaring. Linen hanging to dry on the hedge of a cottage garden, may be passed without displeasure; but the clothes of men, women, and children, surrounding the cell of an anchorite, or the oratory of a monk, have their natural unseemliness increased by the contrast. On the other hand, a fine-dressed lawn with miserable cottages may be compared to the laced clothes and dirty linen some foreigners were formerly accused of wearing. The whole of a gentleman's estate should be his pleasure-ground; the village should be one object in the scene; not shut out from it. There may be a little more polish about the mansion, but it should not be an unnatural contrast to the surrounding objects. The face of no country is bad, but as it is disfigured by artificial means; and the cheapest and best improvement is, merely to remove what offends, and to take care that the buildings or fences that are wanted are neat and appropriate, exhibiting distinctly their real intention. Plimley is a friend to single cottages, because two families under one roof may have more causes of contention arise between them. On the other hand, in illness, poor people have frequently the merit of forgetting their differences; and then the assistance they are inclined to give each other, is made more easy by nearness of situation. It is possible, however, where two, or even three houses are joined together, to contrive the gardens in such a manner, that there may be a little interference; and sometimes three neighboring families may do better together than two.

4. Occupation.

On the borders of Wales the farms are small, many not exceeding twenty acres; on the east side of the county from one to 500 acres; farmers in general very industrious; work along with their servants; wives brew, bake, dairy, and at spare hours spin and get up a piece of linen cloth for sale every year. Leases for lives formerly very common. Blakton, of Kilnall, has taken great pains to prepare printed leases, which answer very well; the term he recommends is seven, fourteen, or twenty-one years; by being printed the farmer can read them at his leisure.

5. Implements.

Plough with two wheels, drawn by four or five horses, or six or eight oxen in the strong lands, and two horses with a boy to drive in the turnip soils. Various improved implements and threshing machines; some excellent mills on Lord Stafford's estates, driven by steam.

6. Enclosing.

Much practised and still going on. Fencing hedges is usually very ill done in Shropshire; it is a business which requires great nicety and judgment, and has the most ignorant operators to perform it in general; who, in the first place, cut downwards through more illness, instead of upwards, and so expose the heart of the plant to the weather. Many miles of hedges lately planted on the Stafford estates.

7. Arable Land.

Following very badly done on the strong lands. Common crops of the county wheat, barley, oats, pease, and turnips. Pease found not to be well unless grown on a sharp gravel or sand; those grown on clay given to pigs and horses. Some hemp and hops cultivated.

8. Grass.

Some natural meadows on the Severn and other rivers; not much attention paid to them. Artificial herbage and grasses grown on the turnip soils.

9. Gardens and Orchards.

Many farmers have small orchards, from whence they make a little cider for home consumption, and on the confines of Herefordshire and Worcestershire the orchards are larger, and cider is made for sale.

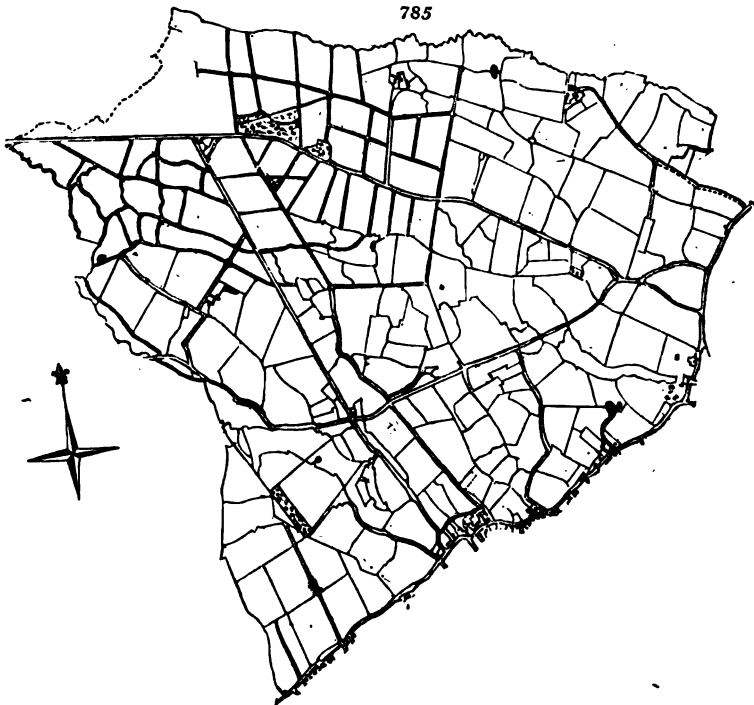
10. Woods and Plantations.

A good deal of hedge-row timber, and some fine oak woods; also numerous young plantations. Narrow-leaved elm reckoned an excellent hedge-row tree, but the broad-leaved better timber, and less difficult as to soil and situation. In this county few persons will bury their relations in any but the best oak timber, which contributes much to its scarcity.

11. Improvements.

Marl used, and some irrigation. A good deal of draining done with brick, stone, and flagg wood. Some bogs drained in Ellington's manner. On the Lilleshall estate of Lord Stafford, (fig. 785.) in 1816 and 1817, there has been executed about 17,000 yards of embankment; 27,000 yards of water course

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deepened and scoured; 46,000 yards of main ditches made or deepened; 315,000 yards of fence-ditches deepened, scoured, and straightened; 49,000 yards of old fences stocked; 30,000 yards of new quick fences made; 21,000 yards of turf draining; and 468,000 yards of under-ground draining laid with tiles and filled with stones. Besides the erection of many new farmhouses of the most commodious plans and substantial execution. But to have an adequate idea of these and other improvements effect-

ed by this munificent and patriotic nobleman, it is necessary to pursue the very interesting work of Loch already referred to.

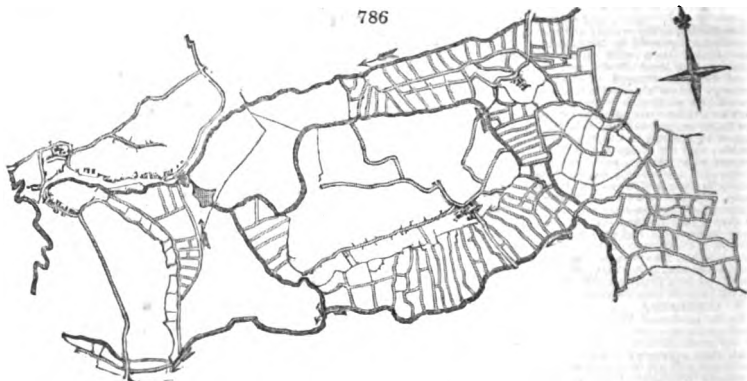
On the *Widdowood* estate of Lord Stafford (fig. 786.) excellent roads have been formed, so that several parts before inaccessible in winter and during wet weather, may now be approached at all times with ease. The effort, as Loch observes, has thus been to add so many acres to the estate. But the most considerable work executed upon these estates, is the drainage of

the extensive district alluded to, called the Wildmoors. The extent and nature of this improvement is such as to deserve a particular and detailed description. Some adjoining properties have benefited by this work, and contributed to the expense of it, which was done under the authority of an act of parliament. But as almost the whole of the land belongs

to the Marquess of Stafford, and the expense having been chiefly borne by him, the direction of its progress, and its preservation hereafter, is entirely vested in a surveyor chosen by his Lordship.

These moors consisted of an extensive tract, amounting, with the land similarly circumstanced, to near twelve hundred acres. The soil is composed of a fine black peat, incumbent

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on a bed of red sand, full of water. They are bounded chiefly by the upland part of these estates, and surround the parish of Kynnersley, which also belongs to it, and which is composed of some of the finest turnip and barley soil in the kingdom. They had evidently formed the bottom of an extensive lake. The different brooks from the surrounding country held their course through them. These brooks are known in the country by the name of *Strines*, being distinguished from each other by the name of the places from which, or past which, they flow. Their course to the Tearn (which river drains the whole of this country into the Severn) was devious and crooked in the extreme, injuring to a great extent the land through which they ran.

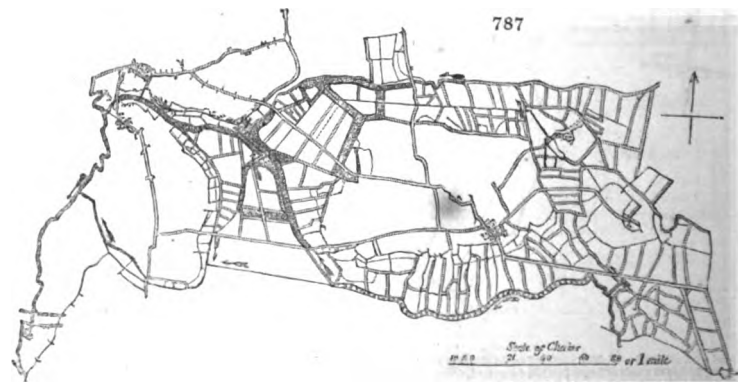
A great proportion of these moors was occupied by the tenants of the adjoining farms, who turned their stock in upon them for a portion of the summer season only. During the rest of the year it was impossible to use them. They afforded but a small quantity of food, and were in most places so wet, that it was at all times difficult to walk over them, it being necessary to select the hardest places to step on. They were covered with water after almost every severe rain, owing to which the inhabitants of the neighborhood were subject to frequent attacks of ague. The adjoining lands, besides, to an extent exceeding six hundred acres, were kept in nearly a state of nature, owing to there being no level by which they could be drained, while this extensive district continued subject to such inundations.

The difficulty which occurred, in draining this tract of land, arose from the want of level, and from the river Tearn being pounded so high by the mill pools, as to throw the water back to a great distance upon the land. The plan for draining this extensive district was extremely well conceived, and judiciously laid out, in the double view of securing this object, and of interfering as little as possible with private property and the existing establishments situated on the Tearn. It was suggested by John Bishton, Esq. the first commissioner under

the Act. The great object was to gain as much additional level as would create a run throughout the whole extent of the moorlands. This was to be obtained by beginning the cut which was to carry off the water a considerable way lower down the Tearn than the water had hitherto been discharged into that river, and a good deal below the mill-pond at Long, which occasioned this pondage. The original courses of the strines were straightened and widened, but they were still made to convey the water from the uplands, and to discharge them into the Tearn in their original direction. To prevent them overflowing the adjoining lands, and to cut off the effects of the back pondage of the Tearn on the upper moors, these brooks were embanked for the whole length of their course through the Wildmoors. These are technically called *argue* banks. At the back of these banks deep ditches were carried, but in a more direct line than the course of the strines. Into these ditches the drainage of the moor-lands is emptied. The level which was thus brought from the river Tearn, from below Long Mill, was carried in a tunnel under the Shrewsbury canal, and was conducted below the several strines in syphon culverts, and was communicated with the ditches described, as having been made behind the banks which confined the waters of these brooks.

In some instances, it has been necessary to construct one set of culverts over another, in order that the waters coming from the uplands may be kept in the several brooks through which they had constantly flowed, and that this water flowing from the uplands might not fall into the back drains; it being again explained, that the water flowing from the higher grounds is still confined to the original strines or brooks on an upper level; the drainage water alone of the moor-lands being thrown into the back drains. Thus has a great additional level been obtained, and the whole of this district is now entirely relieved of water, and such a thing as a flood has not been known for years. This district is, in some instances, so flat, that the old course of the Preston strine, which formerly

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This district has been subsequently divided into regular enclosures, by great ditches, which fall into the main drains; and, wherever it has been possible, these ditches have been made to serve this purpose, as well as that of a fence to the new roads which have been constructed across these moors. In one instance, one of these roads has been carried in a straight line for about two miles. On each side of this road trees have been planted, at regular distances, which will soon form one of the finest avenues in England. These moors are besides all regular under-drained by turf drains, which stand remarkably well. In the different ditches are placed flood-gates, to pound back the water during the summer, preserving the meadows in a state of perpetual verdure. The water is let off at least once in every fourteen days, and being drawn off with as much velocity as possible, it scours and keeps clear both the ditches and the underground drains; — the mouths of these latter are all defended with tiles. The moorlands have been greatly improved by very heavy and repeated rollings and top-dressings; and their value as let to a farmer, in many instances, is fully doubled. This improvement has cost a very large sum of money; which was increased beyond what was necessary, owing to the inefficiency of the late surveyor belonging to the commission, which is not yet closed. The drainage, however, has lately been put under a surveyor (Lewis), approved of by Lord Stafford in terms of the Act, and the expense is diminished, and the whole put in better order. A very rapid improvement has taken place on these lands. In place of being the very worst part of the estate, they are rapidly becoming equal to the best and finest meadows on it. In order to shelter them from the blasts which come round the Wrekin, from the Welsh mountains, they have been intersected by various plantations. A plan of the Wildmoors previous to, (fig. 786.) and another subsequent to this improvement, (fig. 787.) will serve to give an

7011. STAFFORDSHIRE. 780,000 acres of hill and dale, some parts rugged and others smooth, but on the whole more a mining and manufacturing than an agricultural county. The Marquess of Stafford, Lord Anson, and Marquess of Anglesea, are the chief improvers. Excellent markets for produce within the county in consequence of the numerous manufacturing towns and villages. (*Pitt's Report, 1808. Marshall's Review, 1813. Lock's Improvements, 1819.*)

1. Geographical State and Circumstances.

Climate. Air sharp and cold, and inclining to wet; annual rains thirty-six inches; those of London twenty or twenty-one inches; of Upminster, in Essex, nineteen inches; and a quarter less than forty; of Ireland forty-two to fifty. Annual sun on the west side of the kingdom double that on the east side.

Surface. In the north side of the county hills arise, forming the commencement of a ridge, rising gradually higher and higher into Scotland, under different names: here called *Moorelands*, then *Peebles*, then *Blackstone Edge*, then *Craven*, then *Stannmore*; and then, parting into two horns, called *Cheviots*.

Soil. Very various; about one-third of the county strong loam or clay; one-third mixed soils of almost all sorts, and the remainder light, or manufacturing operatives. A specimen of one is given (fig. 788.), which contains a living room (a), working or lodging room (b), pantry, dairy, cellar, &c. (c), cow-house (d), with a water closet, and three bedrooms over. Leases generally granted for twenty-one years. Little made by farming unless with a combination of all, or most of the following circumstances: First, an easy rent; second, a pretty good and extensive farm; third, economy and industry; and fourth, length of time. In the present system of farming, at a moderate rent, the writer of this knows from experience, that it requires not only the most diligent industry, but also the most prudent economy, to keep the balance on the right side. To which Marshall adds, "I have rarely found a farmer making a fortune by his profession alone, unless on fresh land, on virgin marsh, old grazing ground, ancient sheep walk, or well soiled common; a fortune, I mean, any resembling that which, with the same ability and industry, and with a small share of the capital, he would have been making by trade, manufacture, or commerce."

Mines. Valuable and extensive; 50,000 acres or upwards of coal. Iron ore and lime of unknown extent.

2. Property.

Largest estates 10,000, a year, and many of all sizes, from that amount down to 40s. a year. Attorneys generally the managers, but some excellent examples of gentlemen of from 5000, to 30000, a year managing their estates themselves; residing on them, and cultivating a part, and giving every encouragement to their tenants.

3. Buildings.

Some noble mansions, as Trentham, Beaudesart, Ingestre, &c. Excellent farm-houses constructed on some estates, as Trentham, Lord Stafford's, the blue majority, as in other counties, and badly situated. A farm yard has been constructed at the family seat of the Ansons, for a demesne farm of 2000 acres. It was built by S. Wyatt, of London, and consists of the farming steward's house at one end; a range of building along one side contains a brew-house upon a large scale, a water corn-mill for the family and farm with water in which corn is ground for the neighboring poor gratis, and a malt-house: the opposite side and end are occupied by stalls for feeding cattle, store-rooms, stables, and other appendages; and in the middle of the yard is a very complete hogery, built of large stones set edge-ways, and covered with slate, with a boiler for heating hog-food, a cold bath supplied by the mill stream, for giving an occasional swirl to the young pigs. In this building a number of hogs are fatted on dairy refuse, boiled roots or vegetables, pulse, ground barley or bran, supplied by the mill near at hand. At some distance above in the stack-yard and barns, there is a powerful threshing machine, which is worked by the same stream that afterwards supplies the garden, and turns the corn mill in the farm-yard.

4. Occupation.

Farms of all sizes, from twenty-five to 500 acres; many consolidated since 1793. Some very good cottages with gardens, and containing comfortable and commodious accommodations for agriculture, or manufacturing operatives. A specimen of one is given (fig. 788.), which contains a living room (a), working or lodging room (b), pantry, dairy, cellar, &c. (c), cow-house (d), with a water closet, and three bedrooms over. Leases generally granted for twenty-one years. Little made by farming unless with a combination of all, or most of the following circumstances: First, an easy rent; second, a pretty good and extensive farm; third, economy and industry; and fourth, length of time. In the present system of farming, at a moderate rent, the writer of this knows from experience, that it requires not only the most diligent industry, but also the most prudent economy, to keep the balance on the right side. To which Marshall adds, "I have rarely found a farmer making a fortune by his profession alone, unless on fresh land, on virgin marsh, old grazing ground, ancient sheep walk, or well soiled common; a fortune, I mean, any resembling that which, with the same ability and industry, and with a small share of the capital, he would have been making by trade, manufacture, or commerce."

5. Implements.

Very various; double furrow ploughs drawn by four horses, a good deal in use in the light lands. Excellent threshing ma-

chine, and various new implements introduced by proprietors, and especially by the Marquess of Stafford.

12. Live Stock.

Cattle of mixed breeds: some dairying, chiefly for butter to the manufacturing towns; some cheese, but not very good. Calves raised as stock, and sometimes suckled for veal. Sheep in breeding flocks of various kinds. Stock in general neglected as to improvement; all sorts of crosses permitted, so that the original breeds of sheep and hogs are now lost. Pork and bacon are much used among the poorer people, when they can procure them; therefore the sort which is to be fed with the least trouble is to be preferred. A mixture of the Shropshire and Chinese has, in this respect, been found to answer for bacon, and a cross of the wild breed for pork.

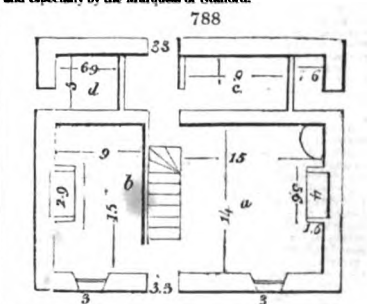
Geese, reared on the commons, and sold to farmers, who fatten them on their stubbles.

Turkeys, reared in large quantities by some farmers, and sold to highers, who drive them to Birmingham and other large towns. Markets in general well supplied with fowls. It is to be lamented that they are generally carried alive to market. Death is no misfortune to an animal that has no previous apprehension of it. But poultry, carried in bags or baskets to market, have several hours of previous suffering, and the burthen and trouble of carrying them thither seem much increased thereby.

13. Political Economy.

Roads generally bad; various canals; trade of Shrewsbury, Llanelli and Welsh webs; used for clothing for the slaves in the West Indies and South America. Manufactures in the county numerous; iron, pottery, porcelain, glass, dying cloth, woollens, flannels, linen, gloves, &c. An agricultural society at Drayton.

chise, and various new implements introduced by proprietors, and especially by the Marquess of Stafford.



6. Arable Land.

Most annual field crops cultivated, including hemp and flax.

7. Grass.

Meadow on the rivers and brooks, and artificial grasses sown; feeding in general preferred to dairying.

8. Gardens and Orchards.

Common to many farm-houses; but few or no sale orchards, and scarcely any fruit crushed for liquor.

9. Timber and Woodlands.

Best timber estate Blithfield Park, Lord Bagot; the park contains many hundred trees of extraordinary bulk, containing from 300 to 400 feet of timber each; much of it is mentioned by Dr. Plot as full grown in 1686. Chillington and Beaudesart also remarkably well timbered. The remains of Needwood forest, chiefly remarkable for its beautiful hollies. On the whole the county abundantly wooded. Sneyd's coppices cut once in six years to make crates and large hamper for the potteries.

10. Improvements.

Irrigation and draining practised, the former only to a moderate extent. Jessop, the engineer, suggests that nine parts in ten of the waters of the kingdom at present run away in waste, a great part of which might be usefully employed; nay, further (putting expense out of the question), that every stream in the kingdom may be made to run equally through the whole year. This position, however extraordinary, is easily demonstrable; for if, upon any given stream, one or more reservoirs be made, capable of containing its flood water, and through the dam or dams be laid a pipe or pipes, whose apertures will just discharge the average produce, the business is done; and though there may be no probability of this business being ever brought to so great a nicety, yet, from hence some idea may be formed of the prodigious extent to which improvements by water may be carried.

Great and radical improvements have been effected on the Trentham estates. The first object was laying the lands together, in farms of considerable extent, varying in size according to the nature of the soil, and other circumstances. In effecting these necessary changes, wherever the old tenant was removed, which was done as seldom as possible, he was, unless he took a farm elsewhere, accommodated with his house and his best grass plots for his life, at a low and inadequate rent; and in every case where it was possible to treat with the person beneficially interested in the lease, and whose continuance in the farm was incompatible with the new arrangement of the land, his interest was purchased either for an annuity, or a

sum of money, to enable him to look out for, and to stock a new farm. The size of the farm being thus enlarged, it was necessary to enlarge the size of the inclosures, and to lay several closes into one, and, where possible, to give them a more regular and uniform shape. This arrangement enabled the landlord to get rid of the long useless lanes, by which a considerable addition to the number of arable acres was acquired.

In order to give each tenant every advantage in draining his farms, the great lines of ditches were executed by the landlord; and wherever it was possible, these were made the boundaries of the farms. Thus the whole drains on the estate were conducted according to one uniform plan, by which the system of drainage was rendered complete, consistent, and the interests of the whole, and not that of any individual tenant, were consulted, nor was any one allowed to interfere with the interests of his neighbor. Such a perfect system will have the effect of rendering the condition of these estates more complete in this respect than that of any other in England. Attention has also been paid, in the execution of these works, to make the water available for the construction of water-meadows, and for impelling the threshing machines of the respective farms.

In consequence of the complete state of ruin in which the great buildings on these estates were found, it was necessary to incur a serious expence in constructing new ones. In this way it has been necessary to erect thirty-seven new, and to repair throughout eight other extensive sets of farm offices, besides the smaller repairs which such estates necessarily require. They have been executed in the most substantial manner. The best possible bricks were used, and the walls covered with tiles or slates; and their cost, including the expence of those thoroughly repaired, may, on an average, be stated at from 1500*l.* to 1600*l.* each.

We have already given examples of these buildings (1763. and 1765.), which are remarkably complete in form, and substantial in execution, and several of them are furnished with threshing machines, driven by water or steam, a thing rare in England, excepting in Northumberland. It is believed, Loch observes, that they unite as many advantages with as few faults, as any buildings of the sort, and that they will supply useful hints to others.

It had been at one period the custom to permit *huts* to be erected in all parts of the estate. These huts amounted in number to many hundreds; they were inhabited by the poorest, and, in many instances, by a profligate population. They were not regularly entered in the rental book, but had a nominal payment fixed upon them, which they paid annually at the court leet. These cottages were built on the sides of the roads, and upon the lord's waste, which was gradually absorbed by the encroachments which the occupiers of these huts made from time to time, by enclosing that which lay next to them. They gradually fell into the hands of a class of middlemen, who made them at an extravagant rent to the actual occupiers. In this manner the poor people were oppressed, and the landlord was in danger of losing his property.

To remedy the evils arising out of this system, the cottagers were made immediate tenants to the landlord, and their rents made payable at the half-yearly audits, an arrangement perfectly satisfactory to them, as they were no longer exposed to the vexations of an intermediate possessor, and, in many instances, their rents to the landlord were less than they had hitherto held their houses. Since they have been placed in this situation, greater attention has been uniformly paid to their comfort and character, as well as to their wants. As they know that their good conduct will now be noticed by, and meet with the approbation of their landlord, a considerable improvement in their habits has taken place. There can be no doubt but that these important changes, which have been effected, far from being agreeable to those who suffered from them. In altering such a system, not only was the direct interest of the existing middlemen affected, but also the expectant interests and influence of many who contemplated the chance of one day benefiting from their favor. These were not few, and it did not always happen that the person who expressed his dissatisfaction looked, was the one most likely to succeed in his wishes: and, in proportion as this object was near its completion, was the vexation and discontent of those who were disappointed. To the larger farms some of these cottages have been added, to enable the occupier to put into them married farm servants, who have thus a great inducement to behave honestly and industriously, and to attend with good will and zeal to the interest and the business of their master. It is by giving such inducements as this, and by making them feel an interest in acting right, that this most invaluable class of laborers can alone be maintained in support of the system.

What has been done by the proprietor, has been well seconded by the exertions of his tenants. A more respectable and enterprising body of men do not exist; and, while they are in a better situation of life than a great body of this class, they have not allowed themselves to forget, that it is by a constant attention to their business, and by keeping in the line of life to which they belong, and never attempting to commit the management of their affairs to bailiffs, that they have gone on steadily improving and bettering their condition. In the knowledge of stock, in their capacity as excellent market-men, in the management of their grass land, and in the cultivation of grain and in cleaning their lighter soils, they are surpassed by no farmers in the kingdom. The rotation they follow is the Norfolk husbandry; and in the cleanness of their crops, and the excellence of their drill turnips, they cannot be surpassed. The breadth of turnip annually sown is very great, and the rapidity with which they have adopted the drill system of husbandry, is as creditable to them as it is satisfactory in the result.

Except ploughing with too many horses, and not being sufficiently active in getting in their harvest, they have fewer practices to abandon, and there are fewer things which they have to adopt from any other of the well cultivated districts of the island, than in general the case of the tenant farmer. It is easy to explain to them the advantages of ploughing with fewer horses, and there is every reason to expect that their good sense will soon see the propriety of these suggestions, as many of them have already adopted this system. The fact is, that the difficulty consisted in the time and care to persuade the ploughmen to adopt it, for as the labor of having the plough so often sown; it is impossible for one or two individuals to contend successfully against the feelings of a country; but when undertaken

by so numerous and wealthy a tenantry, supported by the influence of the landlord, these feelings must speedily give way.

This mode of ploughing has made rapid progress at Trentham. The reason of which is, that it is more generally admitted, that this system is calculated to suit the stiff, better than the lighter soils, inasmuch as two ploughs drawn by two horses, better do much more work than a double plough, drawn by four horses, can do in such soil: the superiority of the work, also, is very conspicuous. On the other hand it is argued, and with some apparent force, that on light soils the double plough, drawn by four horses, and guided by one man, can do as much work as two ploughs drawn by four horses, and guided by two men. In this way the labor of one man is saved. It must be admitted that the argument would be in favor of the double plough, were it not that the work it performs is neither so neat, so perfect, nor can it plough so deep as is done by the two-horse system. It is remarkable that this mode of ploughing with two horses should be confined to the eastern parts of England, from which it was adopted, at no very distant period, into Scotland, where the ploughing with a number of horses yoked along with oxen extended to an extent never practised in any part of this country.

In order to encourage the tenant to make this change, an annual ploughing-match has been instituted, at which prizes are distributed to the best ploughmen. The effect this has already had is very considerable; and at the exhibition in October 1814, no fewer than fifty ploughs started for the premiums. The progress of such a system must be also slow; as it cannot be expected that the tenants will have acquired the use of the old implements, and purchase new. The difficulty of procuring good ploughs operated much against the adoption of this mode of ploughing. In removing this inconvenience, there has been established, both in Shropshire and in Staffordshire, a manufactory for the construction of the most improved implements of modern husbandry; and it is strongly recommended to the persons who have been thus established, that they should take their apprentices entirely from the lads of the country.

It is in the management of their stiff lands, that the tenants are most to be commended. Of late, however, they have made so great exertions in draining their lands, that it is hoped they are beginning to adopt a better system. The defect of their management consists in their ploughing very shallow; the effect of which is, that the depth of soil is not sufficient to protect the roots of the plant from being chilled with the cold and wet (which is upheld by the impervious nature of the subsoil), when the ground is wet, and exposes it to the too rapid action of the drought when the weather is dry. To plough deeper is, therefore, the first, the most simple, and the most important improvement which can be adopted in these soils.

The soil, until lately, had been marled by making use of a large quantity of a bad sort of red clay marl, which they dug out of every field. The effect produced was, to increase the tenacity of the soil, and to render it still less fit for the purposes of agriculture. Of this fact, all the intelligent part of the tenants are themselves convinced, though some of those who are still attached to their old customs, lament the regulations which prohibits them from using that article. On the farms where the inclosures have been entirely renewed, and where, in consequence, a portion of several of the ancient inclosures have been thrown into one close, the bad effects of this system of marling is perceived in a remarkable degree, and a distinct proof of the appearance of the marl is to be seen in the soil of the land which had been formerly so treated, from that which had not. The consequence of this prohibition has been, that the tenants have applied themselves much more to the use of lime as a stimulant, which has repaid them, as might have been expected. It has also put a stop to the rapid deterioration of property, which was occasioned by the digging out of the pits, which every where disfigure and destroy a considerable portion of the farms of this district.

To level down those marl-pits, and to render them again fit for the purposes of husbandry, has been an object of great attention. The tenants have been very successful in this respect, and the parishioners, to whom, from time to time, employment had been afforded, in those years when the circumstances of the country rendered such an exertion of the landlord's bounty necessary. This was more particularly the case in 1817; in which year a vast body of men was employed on each of the Marquis's estates.

In another particular, the management of the stiff soils might be considerably amended; which is, in the mode of working the fallows, which are left too generally to grow full of weeds, in place of being cleaned as they ought to be. The muck, also, is laid on in an improper season of the year, by which its good effects rather go to encourage the growth of weeds, than to improve the crop. At Trentham, the strong soils are of a far superior quality, fit in every respect for the most improved system of wheat and bean husbandry. But the lands were too much subdivided, and the capital of a large proportion of the tenants, was so small, that they were unable to give the right cultivation of their land, that no improvement could take place or be expected, and this estate remained stationary, amidst the general progress which was so conspicuous in the other parts of the county. These defects have been remedied in both instances; and the introduction of some skilful farmers from Shropshire and Cheshire, has given rise to that spirit of enterprise which at present characterizes the tenants of these estates, and which must prove so beneficial to the country, by the additional surplus produce which will be brought to market.

The rotation which they followed, on both estates of the stiff soils was, — fallow, wheat, oats, &c. This was afterwards improved by clover being substituted after the wheat; and an attempt has been made to induce them to try a six-shift course of husbandry, by introducing beans into their rotation. Little progress, however, has, as yet, been made in this experiment. They have been considerable objection, which arises from the defective mode of cultivating the bean-crop. In the first place, they are unwilling to sow them in drills. They are, besides, longer in planting them, and allow them to stand later in the year than they ought to do. The consequence is, that their crop is often damaged, and the nutritious matter of the straw is entirely lost. They cannot be persuaded, therefore, that it forms an excellent and nourishing food for horses and cattle; and the complaint that they make of its being, as

enrichment crop is quite correct, in consequence of their permitting it to stand so long upon the ground.

One improvement the tenants have paid much attention to, and a more valuable one they could not adopt, which is the construction of water-meadows. They have lost no opportunity in making use of whatever water they could obtain for this purpose. They were allowed the rough materials to construct the flood-gates, and the example was shown them as to what could be done in this respect to a very great extent at Trentham. The value of this improvement is well known to every experienced agriculturist in England, and no opportunity should be lost in taking advantage of every circumstance to promote its adoption. There has been lately finished, a new water-meadow on the home farm at Trentham, at the expense of about twenty pounds acre, which will now let for near four pounds an acre, beside the advantage derived to the adjoining upland. This meadow was not worth ten shillings an acre, previous to such an improvement. It consists of a small deep dingle, with steep banks, in which a copious spring rises near the top; the upper part being formed into a fish pond. From this head the water is conducted on the different levels on each side, with the proper catch-water drains carrying the water round the various knolls. The whole being adorned by some fine trees, it forms for its extent a very perfect union of useful and ornamental farming. It shows how much may be made of such a piece of land, incapable of any other sort of useful occupation.

Much money, however, in this neighborhood has been thrown away by overdraining land which has not been previously thoroughly drained; this latter improvement is the foundation of all others. Another mistake has also been fallen into, by attempting to convert into water-meadows peat soils, without first bringing them to a proper state of consistency by means of repeated heavy rollings and top-dressings. A proportion of ten acres of water-meadow to every hundred acres of pasture or arable land, adds at least two shillings and six-pence an acre to the value of every acre of such a farm, in addition to a fair rent being put upon the meadow.

The attention and influence of Lord Stafford has been used in whatever way it could be employed beneficially in extending the comfort or advancing the good behaviour of his cottagers; a conduct so characteristic of the great and worthy proprietors of these kingdoms, that it must ever distinguish them in the history of human benevolence.

Schools, wherever they have been necessary, have been encouraged, either aiding them by subscription, or by granting the accommodation of school-houses. Two Banks for Saving-one at Lilleshall and another at Trentham, of which Lord Stafford is the treasurer, his benevolence and the whole details are conducted by his managers, assisted by the parochial clergymen, and the principal tenantry, and their success among the agricultural laborers has been very gratifying.

The charities of this family are worthy of an English nobleman, and during the residence of the Marquess and Marchioness at Trentham, there is distributed daily, to every poor object, who is travelling along the road, and who applies for the same, a portion of good wholesome bread, in quantity about fourteen ounces to each full-grown man, and less in proportion to women and children, with a pint of good table-soup. The number of people who received this donation in 1819, amounted to 9504 men, 2576 women, and 1789 children, consuming 1590 loaves, and 1703 gallons of beer. From this charity are excepted all soldiers and sailors receiving the King's pay, all persons residing within the parish of Trentham, or in its immediate vicinity. Other distributions take place on particular occasions; for example, to those who reside in the parish, annually on St. Thomas's day, there is a distribution of a certain quantity of beef to the poor. During 1819, there were 12,785 quarts of rice soup, and above 8,000 quarts of milk, distributed within the parish, besides 14,154 quarts of milk given away under the head of allowance. Such facts are strongly illustrative of the beneficial effects derived to the

poor, from the residence of the great families of England, on their respective estates.

The foregoing statement would have been given with some hesitation, had not the facts been of a nature rather to exhibit and illustrate the character and extent of the charities distributed by the great families of England in general, than as being at all peculiar to the instance to which the details belong. And these facts may help to explain to foreigners the nature of the conduct which exists between the richer and poorer classes in this country.

The town of Lane-End, one of those which compose the Staffordshire Potteries, is partly situated on, and is partly contiguous to the east end of the Trentham estate. The inhabitants being supplied with water, carried in barrels, they petitioned to be provided with this necessary article, which request has been complied with; and this town, after a very considerable outlay, now enjoys a regular supply of water, conveyed in iron pipes.

The character of the numerous cottages upon the estate, is also an object of great solicitude, and without any interference with the manner in which a man may choose to occupy himself, their regular and decent behavior is made the subject of care and attention; and the steward has strict directions to watch carefully over them, and where possible to promote their improvement. Wherever a potatoe garden can with advantage be added to their cottage, that accommodation is afforded them. In the vicinity of Trentham, the cottages are of the best sort, and with their gardens kept in the nicest order. To almost every one of them is attached land for the maintenance of one or two cows. It is a circumstance worthy of remark, that of all the laborers who possess a cow, none receive less than the poor's rate, except one widow at Trentham, who has a large family, and even in this instance, the relief she receives is in a less ratio, than any person laboring under similar difficulties.

11. Live Stock.

Cattle generally of the long horned breed. The Staffordshire cow is generally considered a tolerable milker, as well as feeder.

Sheep. Three sorts considered native breeds: the grey faced hornless or Cannock head sheep, with fine wool; the black faced horned, with fine wool; and the white faced hornless, with long wool.

Swine. A cross between the stouched-eared and dwarf breeds; require little attention or feeding, and easily get fat on the refuse of the dairy or barn. Fitt, the reporter, had a very fine sow, which littered ten at the last.

Rabbits. Wild in the sandy lands. A good many bees kept; Thorley's plan tried, but bees are found to succeed best in straw hives thatched in autumn. "Those which have not raised a sufficiency of food for winter, it is doubtless humanity to destroy, as sudden suffocation is better than a prolonged but sudden starvation."

12. Political Economy.

Roads now generally good; numerous canals; several private rail roads. Manufactures, iron, hardware, nails, glass, toys, japanned goods, potters ware, cotton cloth, silk fabrics, leather, woollen, linen, and many others. Manufactures some times carried on in the country in straggling groups of houses, but for the most part in towns. Many thousands both of men and women employed in making nails. An agricultural society at Newcastle and another at Litchfield.

Experimental farming. "It would be a wholesome plan for the Board to commence farming upon their own ideas, particularly in counties where the modes of agriculture seem improper; for instance, Lancashire, Westmoreland, Cumberland, Northumberland, &c.; by which peculiar demonstrations their plan might be initiated; for hearing or reading of any particular practice will not do for farmers in general." Such is the reporter's opinion, in ours a more erroneous one.

7012. WARWICKSHIRE. A surface of nearly 600,000 acres, mostly flat, but generally rich in soil and beautiful in appearance. It is chiefly a corn county, and produces excellent wheat, but also many fat cattle, and formerly much cheese. There are no distinguished agriculturists in the county; but it has produced more good to agriculture than many others. By giving birth to Elkington, who gave rise to much discussion of draining. (*Wedge's Report*, 1794. *Murray's Report*, 1806. *Marshall's Review*, 1813.)

1. Geographical State and Circumstances.

Climate, mild and healthy. S.W. the prevailing winds; effects of an easterly variation felt till the middle of May, and vegetation checked; not however by excess of damp or frost.

Soil, chiefly clay or sand, marl, and limestone. The portion of sandy or moorish soil very small.

Minerals, coal, limestone, freestone, iron, blue flagstone, marl, the clay and soap-stone, as at the head of the late Earl of Warwick attempted to prepare for sale as a soap.

2. Property.

Largest estate Stone-Leigh, Rev. Thomas Leigh, 25,000 acres; but a great variety of extent, and some curious and absurd tenures.

3. Buildings.

Warwick Castle and Ragley first rate edifices. Old farmhouse built of mud and timber, and frequently at the extremity of the farms. The Duke of Buckingham, at Dunchurch, has constructed some good farmeries. Cottages miserable hovels.

4. Occupation.

Farms from 80 to 500 acres: 150 the average size; on the increase. Farmers in general exceedingly idle and indolent; are considered as at the head of the profession, told Murray "he did not see any advantage the county of Warwick would derive from such a survey; that it must do a great deal of hurt instead of good; and that such being his opinion, he declined giving any information on the different heads of question put to him." Lands generally held at will, but very few lease farms. Climate, in general, is a drawback on industry and improvements: farmers that have cheap farms may farm well, but these that have dear farms must farm well, or their career will soon terminate.

5. Implements.

Ploughs the double and single Rotherams with wheels, the

double drawn by five or six horses in a line, and single plough by three and four or five horses in a line, and in both cases with a driver. Small's plough with two horses abreast, and no driver, the reporter remarks, would make better work and do more of it. Some winnowing and threshing machines in use by proprietors.

6. Tillage.

Large crooked ridges gathered very high with a small one between; and only one taking per day throughout the year. Following general, and not two white crops.

7. Grass.

235,000 acres in meadows and pastures, and 60,000 in artificial herbage. Formerly dairying common, and Warwickshire cheeses produced in abundance; but now breeding is fast assuming its place. Old pastures often overran with tall-bills and rubbish. Murray very prophetically observed, that if peace were to take place, grass lands would be safer for the farmer than corn lands. Dairying and feeding both in practice.

8. Gardens and Orchards.

The gardens of the Marquess of Hertford noted for their pine apples; few sale orchards of any extent.

9. Woods and Plantations.

Oaks and elm every where abundant; the Leigh estate the best wooded, but every where abundance of timber.

10. Improvements.

Much draining done in the northern part of the county, but it is rather singular that the names of Fawcett, Elkington, or their farms are not once mentioned in Murray's report. Joseph Elkington lived at Princethorpe, in Stratton on Dunsmore, six miles S.W. Coventry, and afterwards at Birmingham. He died in 1806. He was a more empiric practitioner, and knew nothing of geology, the only foundation for draining on scientific principles; less even than some of his contemporaries, as Fawcett has ably shown in the Derbyshire report. Irrigation practised in a few places on a small scale.

11. *Live Stock.*

No particular breed of cattle, but as feeding is the prevailing practice, farmers buy in whatever breed they think will pay them best.

Sheep a good deal attended to; the large polled sheep, or ancient Warwickshire, now generally mixed with other breeds. The first cross of a Leicestershire ram and Warwickshire ewe produces the best sheep for the butcher.

Horses, the heavy black Leicestershire breed; a good many bred, both of cart, coach, riding, and hunting horses.

7013. LEICESTERSHIRE. 522,940 acres of gently varied surface and fertile soil; distinguished for its pastures, and for the progress which has been made in the improvement of cattle and sheep. It is the county of Bakewell, whose name will ever stand at the head of breeding farmers. (*Monk's Report, Smith's Geological Map, 1821.*)

1. *Geographical State and Circumstances.*

Climate mild and temperate; no mountains or bogs to produce a cold or moist atmosphere at the commencement of the year.

Soil; no stiff clay or sand, no chalk; the peat bogs which existed have been long since drained, and become meadow soil; clayey loam, sandy loam, and meadow, compose the soil of the county. Dishley Farm, so well known, consists of a mild friable loam, of a good depth, on a clay or marl bottom.

Minerals: coal, lime, lead, iron, slate, and freestone; all worked. A mineral spring at Burton Lazars.

2. *Property.*

Estates generally large; that of the Duke of Rutland has been most improved, and always managed in the most liberal and benevolent manner.

3. *Buildings.*

Many very magnificent, as Belvoir Castle, Donnington Priory, &c. Farm-houses built at the commencement of this century are of very inferior construction; timber and plaster covered with thatch. In general, the modern enclosed parishes have the worst farm-houses, they being almost always cooped up in the villages; in the more ancient enclosures, farm-houses have been erected in the midst of the occupations, and built with better materials. Dishley farm-house is of ancient construction, and has probably been built at different times, whence it wants regularity and compactness; it has, however, taken altogether a style of pastoral simplicity, united with neatness, and exhibits a specimen of that judgment and taste which joins convenience with economy, so far as it can be attained without vulgar design; the out-buildings too seem to have been put up at separate times, as wanted; the yards and pavements are remarkable for neat cleanliness, and the whole farm business for being conducted with good order and system. The houses of other principal breeders are comfortable and substantial, and of course fitted up in a style suitable to the taste and situation in life of the occupier.

Cottages generally in villages, and formed of mud walls and thatch; a few good new ones of brick and native slate.

4. *Occupation.*

Farms of all sizes, a great many from 80 to 100 acres, on which the farmers work with their own hands; near market-towns, many under 100 acres, occupied by tradesmen and manufacturers; general size, 100 to 200 acres; and those of the principal breeders from 200 to 500 acres. Land chiefly in pasture for sheep, the dairy feeding cattle, breeding horses, and hay for winter use; dairy farms have also sufficient arable land to produce straw and turnips for their own use; the most inferior soils in aration. The Duke of Rutland has 2000 acres in hand, including park, woods, gardens, &c. At Donnington, Lord Moira had 370 acres, under a Northumbrian paliff, besides the park of 450 acres. Dishley Farm, near Loughborough, the occupation of the family of the Bakewell's for three generations, and now of Robert Honeybourne, nephew to the last Robert Bakewell, who died a bachelor, contains between 400 and 500 acres.

Irrigation is judiciously practised, and the culture of the arable uplands has been long conducted on so correct a system, that few weeds now come up; the most troublesome is chickweed. Heifers of three or four years old draw in the cart or plough, three of them form a team, and work nine hours a day. Farmers in general intelligent. Leases not universal.

5. *Implement.*

Plough with two wheels, and drawn by three, four, or five horses, or cattle in a line walking in the furrow. Thirty years ago, wheels were first applied to the fore end of the beam, and it was found that by pitching the ploughs a little deeper, and setting the wheels so as to prevent its drawing in too deep, the wheels were a sufficient guide, and the plough required no one to hold it, except in places of difficulty; one person steering was therefore sufficient to drive in the team, turn the plough in and out at the ends, or guide it in particular hard or soft places. Soon after another furrow was added, by slipping an additional beam to the off side of the former, one somewhat lengthened, with foot share and shellboard; the same number of wheels, viz. one on each side, guiding the two furrows. Among the uncommon implements may be included, a rack and manger for four colts on wheels, to be drawn from one pasture to another. It is square in the plan, and therefore each colt has a side to itself, and cannot kick or bite at the others; a break for shoeing one, a fastening for ewes, to lessen the fatigue of the ram during copulation, and also several ploughs, rakes, &c. the invention of Hanford & Co. at Hathern, near Leicester.

6. *Arable Land.*

Many farms have none. Drilling corn crops principally introduced; but not for turnips, even at Dishley; thought to lose ground; cabbages and rape a good deal cultivated on the soils too strong for turnips.

7. *Grass.*

Excellent meadows on the rivers and rills; fertilized by inundations; upland pastures sometimes moured. Stilton cheese made in most villages about Melton Mowbray. On the Trent, considerable patches of reed, which pay as well as the best meadow land.

8. *Gardens and Orchards.*

Gardens much wanted to cottages; orchards rather neglected, though the soil is in many places well adapted for them.

Poultry abounds owing to the prevalence of small farms; great quantities sent to Birmingham and London.

Geese, as pheasants, partridges, and hares, more than commonly abundant.

12. *Political Economy.*

Roads tolerably good, several canals; innumerable manufactures, especially at Birmingham, for iron, and others of the metal kind, and Coventry for ribbons.

13. *Means of Improvement.*

Leases; a more economical mode of laboring; draining; drilled root and herbage crops, and better rotations.

9. *Woods and Plantations.*

Few, excepting about gentlemen's seats, and in the hedge-rows. Willow, as pollards, grown on Dishley and other farms, to supply stuff for hurdles, rails, and gates.

10. *Improvements.*

Elkington was a good deal employed by the proprietors. Irrigation more extensively practised in this county, than in most others.

11. *Live Stock.*

Cattle, the long horned breed. What was the particular breed of cattle in Leicestershire before the middle of the last century, about which time Bakewell began his exertions, it is difficult to determine; perhaps there was not any distinct breed, with particular specific characters, whereby they might be distinguished; although there were always great numbers bred, yet the produce was never equal to the supply of the county; there always was, and still is an influx from Ireland, Wales, Scotland, Shropshire, Staffordshire, Herefordshire, Northumberland, and Lancashire; the latter of which were most probably the stock from which Bakewell began his breed. His first best cows, it is believed, were artfully obtained from Webster, of Canley, in Warwickshire; and his famous bull, Prophecy, a bull from one of these cows, or from one procured from Phillips, of Garrington, and a bull from Northumberland. From these beginnings, with great judgment and attention, in a short time he reared some beautiful cattle; they were long and fine in the horn, had small heads, clean throats, straight backs, wide quarters, and were light in their bellies; they were also very quiet in their temper, and they grew fat with a small proportion of food, but gave less milk than some other breeds. Some years ago Bakewell put three new milked cows in three separate stalls, a Holderness, a Scotch, and one of his own breed; the Holderness ate most food, and gave much the greatest quantity of milk; the Scotch ate less food, and gave less milk, but produced most butter; his own cow ate least food, gave the least milk, and made the least butter, but laid on the most flesh; hence it will follow, that the Dishley cattle are most adapted for the grazier, and the produce of beef. No man, perhaps, ever made more comparisons between the different breeds of cattle, than Bakewell, and no one that was able to tell so much, has told us so little about them. Many capital herds of cattle in the county, and a number of dairies, from which great quantities of cheese is sent to market.

Sheep, the present stock consists of three varieties, the old and new Leicester, and the forest sheep. The old breed, which is spread over Northamptonshire, Warwick, and Lincolnshire, are an improvement on the ancient stock of the common flocks. The new breed Bakewell produced by breeding from selected sheep from his neighbors' flocks, or those of the Gibbers. A ram society was formerly by agreement of others, and still exists, the object of which was a monopoly of ram-letting. The late Bakewell bound himself, and his successor, Honeybourne, binds himself, not to engage nor show his rams to any person, till the members of the society have seen them and are supplied, and not to let a ram to any person within fifty miles of Leicester, for a less sum than fifty guineas, for which and other privileges, the society pay a large annual sum; and Honeybourne, as well as every other member of the society, confine themselves not to sell, nor to let their ewes at any price, nor to show their rams at any public fair, nor at any other place than at their own house, and then only at stated times, from the 8th of June, to the 8th of July, and again from the 8th of September, till the end of the season; with several other regulations of a similar tendency.

Ram-letting alone has produced to Bakewell 3000*l.* in one year. The greatest prices were paid about 1789; since that time they have declined; but about 1807, from sixty to 100 guineas has been given for the use of a ram for one season. Much curious information on this subject will be found in the report.

Folding is not practised.

Putting is practised as usual with grass, and in winter and spring with artificial food. Bakewell frequently fattened sheep in stalls; in three days they were reconciled to their confinement, and began to feed. "Further than this," the reporter's informant, Bakewell's successor, "knows not, or is not inclined to communicate."

The forest sheep are confined to Charwood; they are grey-faced, and partially horned, but now almost extinct.

Horses have been bred in Leicestershire from time immemorial, and the breed considered superior. Bakewell went through Holland and Flanders and purchased some Friesland mares, which excelled in those points wherein he thought his own horses defective, from which, with great labor, expense, and judgment, he produced some capital horses, and in particular his famous horse Gee, the noblest, and most complete and beautiful creature of the kind that had been seen in Europe. How far his elegant points were adapted for the labor that horses of this sort are principally designed to perform, is a question, perhaps, unintermingled; but this, as it may, beyond all controversy be strong and handsome, and commanded the admiration of all who saw them; for a time he was the first subject of conversation, and almost the wonder of the day; he was taken to Tattersall's, and shown there to the nobility and gentry, with great approbation; and he was the honor of showing him personally to His Majesty; he was said to have been very quiet and docile, and Bakewell, in de-

scribing his points, invited his Majesty to touch him, which was declined. He was killed by lightning, in his pasture. The present horse-system at Dishley is this: three or four very capital blood stallions are constantly kept; these are occasionally worked, and are always rendered docile enough for that purpose; if wanted, they kept at home for at two guineas a mare, and these let out never at less than one guinea. Eight or ten brood mares, of the same stout blood breed, are also kept, but no geldings; these do all the farming work of between 400 and 500 acres, with occasional assistance from the stallions, as well as from bullocks and harness; of the mares, all that are fit are put to the horse, of which three are reckoned upon the average to rear two foals, allowing one in three for casualties.

Asses used in many parts of the county for carrying burdens, and lately introduced as farmer's stock; especially for clearing green crops from clayey soils, in wet weather, their step being light. The turnip planters open at bedtime, to let out the load. Lord Morris had Spanish stallion asses, fourteen bands high, which he let out to cover at two guineas a mare.

7014. DERBYSHIRE. A mountainous and hilly surface of 622,080 acres of great variety of soils but more remarkable for its mining and manufacturing productions than its agriculture. It is, however at the same time both a corn and pasture county, and noted for its cheese; it is every where full of industry and interest; and the Report by Farey, in three volumes, is one of the most interesting and valuable of the county reports: it is an extraordinary example of industry, research, and excellent general views, and will be read with great profit by every class of readers. (*Brown's Derbyshire*, 1794. *Farey's Agricultural and Mineral Survey*, 3 vols. 1811 to 1815. *Marshall's Rev.* 1812.)

1. Geographical State and Circumstances.

Climate. Cold on the hills, but mild in the plains; in the winter hoar frosts often injurious; no prevailing winds; rain about twenty-eight inches per annum.

Soil very various, chiefly calcareous.

Minerals. Lead and iron those chiefly worked; also some zinc, calamine, black jack, manganese, sulphur, &c.; coal, lime, alabaster, slate, freestone, paving stone, rolling, grinding, scythes, and cutlers' stones, and a variety of others, both for use and ornament, as spar, &c. Clay in some districts, as at Overmoor, is burned by spade-fuels, dried, and mixed with small coals in heaps, for the roads. E. M. Munday, Esq. of Shipley, formed his private roads of a sort of bricks, made without the corners to avoid the duty.

Water. When scarce, drinking ponds made by puddling and paving in the Gloucestershire manner. An artificial pond discovered in 1805, concealed under peat, the head of which was puddled in the centre; a proof that puddling is no new art. Stone cisterns, placed in the lines of neatly-cut thorn hedges, serve to supply two fields: the water poured to them in thin zinc pipes, so being cheaper, and perhaps more durable, than lead.

2. Estates.

Of various sizes as in other counties; managed by attorneys, at a low salary, who make it up by law business and otherwise.

3. Buildings.

Chatsworth, Kedleston, and some other noble stone mansions in this county; some good houses, covered with cement, (known in London as Atkinson's) made from clay stones found on Lord Mulgrave's estates in Yorkshire, and which Farey considers as superior to that made from the clayballs of the London clay stratum. Grottos frequent, fitted up with the spar of the county. At Ashover a frieze of a chimney-piece, representing a section of the strata taken across the parish. At Chatsworth, and various places, the spits in the kitchens turned by water-wheels, of the overhead kind, supplied by small lead pipes. Hair lines, in covered boxes, placed on drying-stands, and the lines wound and unwound by a handle, for drying clothes. At several houses foot latrals, turning spindles, on which were other wheels, dressed with emery for cleaning knives; also brush spindles for boots and shoes, as at the Angel Inn, Oxford; boot-rack, in which boots are reversed on upright pins and taken off by a stick, which prevents dust settling inside the boot.

Farm-houses as in other counties; a few good ones recently erected. One of the most complete farmhouses is that of the Earl of Chesterfield, at Bretby Park; it is of hewn stone, slated, and combines a general farm yard, dairy court, and two poultry courts, including pheasantry. Buildings in general roofed with grey stone or other slate; water, in some cases, conducted down from gutters by a light wooden rod, down which the water runs as well as if it were in a spout or tube, and not blown about by the winds, as it would if no rod were there. Fire-proof floors made by arching them with hollow bricks; in the cottages, cast-iron ovens by the side of the fires very common, and also iron cisterns for hot water; both these were originally brought into notice by the Griffin foundry, about 1776.

Cottages better than in most other counties; some good ones erected by the principal manufacturers and noblemen. Virgin's tower, or other beautiful flowering creepers, and shrubs, and plants, are not uncommon at the cottage; even in this county, some other indications of Englishness to the westward, and their numbers, compared with the inhabitants of the miserable huts in many other districts.

4. Occupation.

Farmers generally of small scale; farmers rank higher in intelligence than those of most southern counties; nothing but house and larger occupations tempting to withdraw this one of the most improved counties of England. Best farmers also at some towns manufacturers or miners.

5. Implements.

Swing ploughs and pair; one-horse carts; good harrows (*fig. 786*); weeding scythes, for clipping off weeds among corn close or rather under the ground; weeding pincers; thrashing machines; cast-iron rick-batter; cattle, either mounted on wheels, which turn round on a pin, so that when the cattle have well trodden the litter on the two opposite sides, in standing to eat from the crib, it is turned half round for them to tread and dung, &c. in the opposite direction. (*fig. 787*) Turnip-slicers, chaff-cutters, bruisers, slate cisterns as milk vessels, &c.

6. Enclosures.

In setting out fences, less attention paid to separating the different kinds of soils than is requisite; walls frequent; and holes often made in them for pasturing sheep; to be closed when

Mules have long been in use for the saddle, road-work, and the plough.

Hops greatly improved by various breeds. Honeybourne seems to have a cross of the wild boar. Astley's is between the Chinese and Berkshire. At Donnington is a German boar, the bacon from whose progeny is of extraordinary sweetness and good flavor.

Bee attended to, but not so much as they deserve.

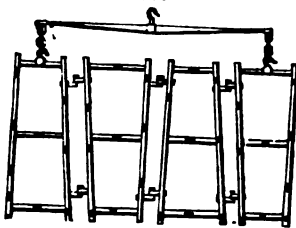
12. Political Economy.

The roads in the north-west of the county, in the neighborhood of Loughborough and Ashby, are many of them laid out upon the concave system.

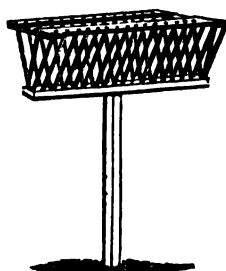
Railways and others were advocates for this system; but it does not appear that they are considered to be attended with any advantages by those who live beside them, and constantly use them. Various railways and canals. Manufactures, wool combing, woollen yarn, worsted, and especially worsted stockings; also cotton-works, hats, patent-net-lace for veils, &c. The Leicestershire and Rutlandshire agricultural society established 1794.

not wanted by a flat stone; stacked lime plastered on the face of a newly planted hedge, (as clay is in Norfolk) to prevent the weeds from rising. Young thorn hedges, with a northern aspect, do best, as the morning sun in spring injures the bud of those facing the south when previously covered with frost.

789



Roots of thorns, sometimes planted as sets with success; all thorn hedges effectually renewed by cutting off the shoots below the surface of the ground; the roots then throw up vigorous shoots. Neatly clipped hedges at Ashbourne. Magnesian, limestone, and marly soils found to suit the holly better than any other.



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7. Arable Land.

Only one-fifth of the county in aration; formerly six horses were generally employed in ploughing, now only two; turnips drilled in the Northumberland manner in various places; some wheat dibbled; oats a good deal cultivated, and oat-cakes or Haver (*Ger.*) cake made, by pouring sour dough on a hot stone; a sprinkling of parsley sown with clover to prevent cattle grazing; sides of oat ricks tucked in with a spade, to leave no loose straws for sparrows to rest on.

Chamomile "is cultivated to a very considerable extent on the limestone and coal strata near Ashover; the flowers are picked by children; dried first in the shade and then on a malt-kiln, afterwards packed tight into bags, and sent to the London druggists; the crop stands three years, and then gets weedy and declines."

Wood cultivated on a small scale.

Widow-wort (*Genista tinctoria*) infests old pastures, and is pulled when in flower, and dried and sold to the dyers.

Yarrow (*Achillea millefolium*) is in some places also taken up tied in bunches, and dried for the dyers.

Valerian (*Valeriana officinalis*) is grown at Ashover, and also elecampane (*imula, helenium*), lavender, peppermint, and rhubarb, on a small scale, in one or two places.

Truffles (*Tuber cibarium*) collected in various places, especially under the shade of the beech trees, and on dry hedge banks. Roses formerly cultivated for the flowers, but not at present.

'8. Grass.

Three-fifths of the county under permanent grasses, (though

it appears by the marks of ridges, to have been formerly every where arable; and the application chiefly cheese-making. Droppings of cattle and horses on pastures spread by rakes, which injure the grass less than any other implement. Fern and other weeds collected from wastes, and dried and burned, and their ashes made into balls, and laid aside, to be used as ley for washing. This practice declines with the frequency of enclosures. When worms are engaged forming worm-casts in fields, scatter barley chaff, fresh and dry from the winnowing machine, which, sticking to the worms when they come out, prick them, and prevent their return to their holes, till rocks, &c. devour them.

9. Gardens and Orchards.

Good market-gardens at all the principal towns, and few of the farm-houses and cottages without gardens. "Samuel Oldknow, Esq. of Mellor, keeps a professed gardener, on three acres of rich sheltered land, by the river Goyte, on the Cheshire side of it, who cultivates, gathers, prepares, and delivers, all the useful vegetables and common garden fruits in season, to his cotton mill work-people and tenants, and renders an account once a fortnight to the mill-agent, who deducts what they have purchased from the garden, from their several wages: the perfection and utility of his arrangement for these purposes cannot but prove highly gratifying to those who wish to see the laboring class well and comfortably provided for from the fruits of their industry. Proper rooms, for drying, cleaning, and preserving garden-seeds and fruits, and his wool-chamber and other like offices, are attached to the gardener's house, and placed under his care." A most productive garden at Belper, on a very poor soil, but irrigated in winter from a cess-pool, in which centres the liquid manure of fifty cottages, belonging to Messrs. Strutt's cotton mills.

Orchards seldom planted, though the soil is well adapted for them in many places.

10. Woods and Plantations.

A good many coppices, the produce of which is much in demand both for mining and agricultural purposes. Sir Joseph Banks, at Ashover, has planted some extensive sites in a proper manner: first planting narrow strips of Scotch fir at the distance of 100 yards, then intersecting them by others, so as to leave the surface checkered; after the Scotch firs are grown a few years, it is the intention to fill the intervening patches with larches, at such a distance as that they will never require any thinning. This plan, as Faver justly hints, is more ingenious or fanciful than likely to be useful; the mixture of the larch and Scotch firs, with a proper attention to thinning, would be a more effectual, speedy, and economical mode of producing timber. Some judicious observations on pruning trees, and the propriety of Pontey's mode, pointed out by various examples. Hedge-row trees, sparingly introduced and well trained, are nearly all that fertile agricultural land ought to contribute to the national stock of timber. Key-bearing ash trees, or any forest tree much given to bearing seeds, no longer increases much in timber, and therefore ought to be cut down; hence male ashes preferable to females, or such as have both male and female flowers on the same tree. The use of the spray and buds of the oak as bark recommended, as practised in Cheshire and South Wales; when collected, they should be immediately sent to a mill and crushed. A most complete seasoning kiln for timber at Belper. Timber often sold by ticket sale, thus described: the vendor meets the proposed purchaser, writes his price in an envelope, and puts it in a glass; the offerers do the same; the vendor opens the envelopes, and if any price comes up to his, then he accepts it, if not, the process is three times repeated, and then the vendor must show his price, if none has come up, but not if any one has gone beyond it. In selling trees with an axe, but disking, if young shoots are expected to succeed, as the sooner the centre-roots the better the wavers thrive. Larch trees bear neglect better than any others, as they never produce timber boughs.

Birch wine has been made from an open grove of about 100 birch trees, near Oulton Hall, for sixty or seventy years past. Thirty trees or more are tapped in a season, about six or eight inches above the ground, in March. A piece of bark, about three quarters of an inch in diameter, is cut out with a gouge, and the wood penetrated an inch or more; an iron spout (Fig. 791 &c.)



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is then driven into the bark below the hole, which conducts the sap to a bottle (&c.). In warm weather the holes soon grow up, and will close to run in four or five days; but in cold weather they will run for a month. Some trees will run twenty-four gallons in twenty-four hours, others not half a pint. The water is sold at sixpence a gallon, to those who make small wine as a substitute for small beer. If the water is scalded, (not boiled) it may be kept a month before it is made into wine. If not, it will keep about a day or two. For making the wine, two pounds of coarse sugar, and a quarter of a pound of Malaga raisins, are added to every gallon of birch water, when cold: it is then boiled about an hour, until it is observed to grow clearer, when it is set to cool, and when about the same heat that beer is set to work, a pint of yeast is spread with yeast, is put into it, and for four days suffered to work freely, when it is barreled, and the same quantity of raisins as before, and about an ounce of linings to every twenty gallons, are added: it seldom works out of the barrel, and in two or three weeks is ready for close hanging down, to remain for three months, and be bottled out at two or three shillings per gallon after it is fit for drinking, but is the better for keeping longer.

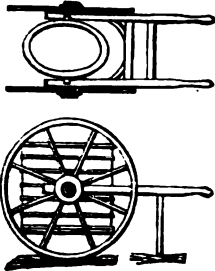
11. Improvements.

Magnesian or hot lime very thinly spread has its inimical properties; and it would seem such limes may be used where

a stimulant rather than an addition of calcareous earth is required. Lime over-burned roasts and runs together, will not slack, and becomes useless: the consequence of too strong a fire being applied to magnesian limes more especially. Might not the dried road of limestone roads be used instead of lime? Many bone mills in use: they are composed of ratchet-like iron wheels and rollers, between which the back-bones of horses, with their adhering ribs, pass with facility, and are crushed into small pieces; the bones collected in London, from the church-yards and other sources; seven quarters drive an acre. Coal ashes almost entirely neglected, though a valuable manure. Importance in draining of bearing in mind the difference between surface and spring draining, and bog and upland draining.

12. Live Stock.

Cow stock for the dairy the prevalent stock in Derbyshire; no particular breed; noticed nine breeds and nine crosses of these. Many consider that rather poor land makes the best cheese, and old sward more and better than artificial grasses. In some places some staked and powdered lime sown on the willow trees within the reach of cows, to prevent their eating them, and tasting the butter. Milk set to raise its cream in yellow dials, with lips; in some places in slate troughs.



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Sheep. Ten different breeds and seven crosses of these and others: rough charleys generally form a part of the accommodations of the farmer.

Horses. Those of Derbyshire ranked next to those of Leicestershire, for being stout, bony, and clean-legged.

Asses in considerable number used by the smaller manufacturers, and in the coal-works, potteries, &c.; also on the iron railways.

Pigs. The Earl of Chesterfield supplies his table with delicious sucking pigs, of a fortnight old, from his Otshelby sow; plan of shaving off the gristly or horny projection of the snout, to prevent digging, recommended. Teething by the neck also suggested for eating down stony herbage crops; split and screw to be used like those for fixing down Salmon's harness men-trap. (Trans. Soc. Arts, vol. xviii. p. 183.)

Poultry. The Earl of Chesterfield's poultry yards at Brethby perhaps as complete as any in the kingdom. The roosting house is well contrived, with covered places for the ducks and geese under the walls, and the whole is constantly kept strewn with fresh saw-dust. The sitting-house, and which serves also for laying, is furnished with flues, to preserve an equal temperature in frosts. In the feeding-houses the fronts, partitions, and floors of the pens are all of lattice-work, which readily take out in order to wash them thoroughly; shallow drawers with fresh saw-dust pass under each pen to catch the dung. The fattening poultry are fed twice a day, and after each the food is taken away, and the day-light excluded, for them to rest and sleep.

A breed of brown American turkeys at Brailford; they roost upon trees at the high point of buildings: cocks weigh twenty pounds when fat, but the hens much smaller.

Geese when let out have a stick about two feet long slung before the breasts of the old ones, which is found to prevent them creeping through hedges, &c.; feed on festuca fulva, &c. When waters are much impregnated with lime, the eggs of geese and ducks that devour them, are so much thickened that hatching becomes difficult.

Hens. At Pleshy a fine breed of black fowls; round Wapworth many game fowls kept for cocking. In Tansley the cockpit converted to a methodist meeting house. Eggs preserved hung in nets, and turned into a fresh position each evening, this being the main expedient in preserving eggs; these yolk subside slowly when left unmoved, and come at length to touch the shells on the lower side, when rottenness almost immediately commences.

Bees kept in various places.

At certain ponds in Sir Thomas Windsor Humbleton's Park, in Wingerworth, are appropriated to the feeding of castrated male carp and tench, which are found very superior in size and flavor to other fish: the late Sir Windsor Humbleton saw this practised in Italy, many years ago, and had one of his servants, who was with him, instructed in performing the operation; which is less difficult or dangerous than might be supposed, and in consequence of which, not more than one in fourteen or fifteen of the fish die.

Angling permitted at Combs-brook reservoir of forty-five acres, the angler paying sixpence per pound for the fish taken. Salmon are scarce on the Derwent, at Belper bridge.

31. Rural Economy.

Reveries as set off red by the Agricultural Society at Derby, as by most farmers in the kingdom, for long and meritorious labor or day service, but seldom for having performed the greatest quantities of job work, or earned the most money by such fair prices. At the beginning of the present century it was calculated, taking the laborer at an average of two shillings and sixpence per day, that he must work four and a half times as many days to earn the same quantities of food, as from three to five centuries back, he could, when his daily wages was fourpence to twopence per day! Part of this was doubtless occasioned

by the many idle winter days which the church of Rome imposed on the people at the earlier periods.

13. Political Economy.

Various concave roads formerly, made through the influence of Joseph, Willm. Esq., of Macclesham; these in a very different state, and illustrate the absurdity of the principles on which they are constructed. To level across a road a string level used. It consisted of a piece of box wood eleven inches long, one and a half broad, and one and a quarter deep, into the top of which a spirit-level tube was deeply sunk, and to the top of each end of this level, several yards of strong whipcord was fastened. In using this instrument, a laborer was placed on each side of the road, having the cord in his hand, which they pulled very tightly and steadily against each other, and thereby made the bubble assume the middle of the tube or either end, according as the two ends of the string were held level or one higher than the other.

None remains of wavy roads (£305.), but nothing to justify any deviation from the general form of slightly convex roads, with straight or even surfaces as to length. The road between Ripley and Little Eaton, where washing or irrigation has been made as a mode of clearing (Com. B. Ag. vol. 1.), was miserably deep, loose, and bad.

In *Manufactures* Derbyshire ranks next to Lancashire, Staffordshire, and Warwickshire.

1. Trades, &c. depending on the Animal Products of the county.

Blanket-weaving, and scouring.
Beet-crushing mills.
Butter.
Button-moulds, of horn and bone.
Candle making, of tallow.
Carpet-weaving.
Cheese.
Carriers or leather-dressers.
Fellmongers.
Fulling mills.
Glue makers.
Leather mills for oiled, and shammy leather.
Meat, beef, lamb, mutton, pork, veal.
Shoe factory.
Skinners, or leather-dressers, shammy, &c.
Soap makers.
Stockings, of worsted.
Tie yards.
Woolen cloth factories, yarn spinning, weaving, and cloth dressing.

Worsted spinning, for the boaters, by hand and jennies.

2. Trades, &c. depending on Animal Substances, imported.

Hat making and unsplit straw hats.
Silk-spinning mills.
Silk stocking weaving.
3. Trades, &c. depending on Vegetable Productions of the county.
Basket and wicket making.
Besom or broom do.
Bont or barge building, for the canals.
Breweries.
Chamomile flowers.
Charcoal burning and grinding.
Charcoal mills, for grinding it.
Corn, barley, beans, oats, peas, wheat.
Hoops for casks, of wood.

Hair makers.
Mattresses, chair-bottoms, &c. of straw.
Millers, flour or meal makers.
Sieves, or riddles for corn.
Shelling, or oat-meal mills.
Timber.
Turning mills, for wood, bobbins, bowls, cheese-vats, dishes, tool-handles.

4. Trades, &c. depending on Vegetable Substances, imported.

Bleaching-houses, and grounds.
Calico-printing.
Calico-weaving.
Carmine-weaving.
Candle wick, bump or bomp-spinning mills.
Cotton-spinning mills.
Dye-houses.
Flax-spinning mills, linen-yarn mills.
Fustian-weaving, thickets.
Hop-bag spinning and weaving, wool-bags, &c.
Lace-weaving, or warp frame-lace making.
Lace-working, or needleworking of frame lace.
Linen-weaving, sheeting, checks, &c.
Muslin-weaving.
Night-caps, of cotton frame knitting.
Pack-thread spinning, string, twine.
Paper-making.
Rope-making, cords, halters.
Rusling-weaving, corn-bags.
Sail-cloth weaving.
Sizing-weaving; principally of cotton, some of worsted frame-knit.
Tape-weaving mills.
Thread-spinning.
Whipcord-spinning.

5. Trades, &c. depending on Mineral Products of the county.

Blackstone making.
Boiler-making, of wrought-iron, for steam engines.
Brick-making, building, draining, fire, paving.
Building-stone, or free-stone, ashler, capping, eaves-slates, gable-stones, paving, ridging, grey slates, or tilestones and stack-posts.
Cannon-balls, or shot and shells.
Cannon-casting and boring.
Chain-making, iron and cast iron.
China-stone, or white potter's chest pits.
Cisterns and troughs of stone, to hold water.
Clay pits, brick, china, fire, pipe, pottery, and tile.
Coal-pits.
Coke-burning.
Copperstone, brasses or pyrites pits.
Fryingpans of iron.
Grind-mills, blade mills, grindstone mills.
Grindstones.
Gypsum, alabaster, plaster.
Hammer mills, forge, tilt, planishing mills.
Hoops for casks, of iron.

Iron forges and furnaces.

Ironstone pits, argillaceous ore.

Lead mines, or veins of lead ore.

Lead smelting cupolas, and slag-mills.

Lime kilns.

Limestone quarries.

Malt kiln plates, of perforated cast iron.

Marble quarries.

Marble sawing and polishing mills.

Marble pits, for mansuring.

Mill-stone quarries.

Nail-making, of cast iron.

— clasp (or carpenter's), and spikes, &c.

— horse shoe.

One-dressing, washing, bedding.

Patten rings, or cloag pipes.

Pipe-making, tobacco pipes.

Pipes, of earthenware, hollow bricks, for conveying water.

— of lead, drawn.

— of zinc.

Plaster of Paris works, gypsum.

Potteries, earthenware, stoneware.

Pot-stones, pye or lump stones for the iron forges.

Punchions, staunches or props, for the coal pits.

Red lead works, minium.

Rivets, of iron, softened, for coopers, boiler-making.

Rolling and slitting mills, for iron bars, plate iron, nail rods.

Rotten stone, or polishing earth.

Sand-pits, casting or foundries, house-floor, mason's mortar, scouring, and scythe-stick sand.

Saw mills, for stone and wood, also with circular saws.

Screws, carpenter's, for wood.

Scythe-sticks and -tones for sharpening scythes, hay knives.

Sheet-lead, milled-lead, rolled-lead. Common sheet-lead is cast by most of the plumbers and glaziers of the county.

Shot, leaden.

Slitting mills.

Sour-works, petrification-workers, gypsum, calcaspar, fluor.

Sulphur-works, annexed to the principal smelting houses.

Tenter-hooks, of cast iron, softened.

Tile kilns, draining, gutter, hip, pan, plane and ridge.

Tire for carriage wheels.

Whiststones, rubbers, hones.

White-lead works.

Wire-drawing, steel.

Wire-working, safes, sieves, screens.

Zinc mines, blend and calamine.

— work, malleable plates, wire pipes, &c.

6. Trades, &c. depending principally on mineral substances, imported.

Axes, hatchets, bills, adzes.

Brass foundry.

Bride-bits and buckles.

China factories.

Chisels, gouges, plane-irons, and other edge tools.

Clock and watch making.

Color-grinding mills, paint.

Cotton machinery makers, for the cotton-spinning mills.

Cutlery, knives, forks, &c.

File-making, rasps.

Flint grinding mills, for pottery glazing.

Frame smiths, stocking loom makers.

Glass-making.

Gunpowder making.

Hoes, (garden, turnip,) paring shovels, trowels, &c.

Implement-makers, agricultural tools.

Malt mills, steel and cast iron, and contemplates, as "the

Mangles, for linen clothes.

Mechanists, machine, tool and engine makers.

Millwrights.

Needle-making.

Reaping-hooks, smooth-edged.

Scissors, of cast iron, cemented to steel.

Scythe-smiths.

Sickles, toothed reaping tools.

Snuffers.

Soda water makers.

Spades, shovels.

Spurs, of steel.

Stirrup-irons of cast iron, cemented.

Tin-plate workers, tin-men.

Washing machines for clothes.

Worsted-machinery maker, for the worsted spinning-mills.

Notwithstanding that many of the manufactures and pro-

ductions above-mentioned, are of small importance,

and may contribute little or nothing towards an export trade

from the county; yet, taken in the aggregate, they must be

admitted to present a most flattering picture of the varied and

great manufacturing industry of the county; showing it to

contribute far beyond most other counties, towards the supply

of all its own wants, and contributing at the same time, in no

small degree, towards the supply and general trade of the king-

dom at large.

Education.

Among the labouring classes, the reporter observes, is better

attended to than in most of the adjoining counties. He

approves of the great attention paid to bringing up children in

habits of frugality and industry; and contemplates, as "the

great and desirable end, their complete emancipation from the

moral slavery of poor law dependence, and its attendant

vices and misery." There are some persons, no doubt, who

may not approve of all that Mr. Farey has advanced on this

subject; for where is the writer that can please every reader?

but there are none, we hope, who would not be gratified with

his sincere and ardent desire for the more general and uni-

versal happiness of the British poor. Though we are of opinion

that very little amelioration of that division of society which

constitutes the agricultural and laboring class can be effected

without an alteration in the laws; yet, we are equally con-

vinced, that no great alteration of what are called the poor

laws would be advisable, till the poor are prepared for it, by

having imbibed such a degree of knowledge as would enable

them to meet the consequences with advantage, or at least

without an increase of misery.

We agree with the reporter, that the case is somewhat

different with the operative manufacturing, and mechanics

In the reparation of the banks which secure the marsh land from the sea, the frontage towns are at the expense; but in case of such a breach as renders a new bank necessary, the expense is assumed according to the highest tides ever known, by level over all the country below such level of high water, under the direction of the commissioners of sewers; the distance from the sea subject to drainage will, therefore, vary according to the level of the country.

South Mulling, greatly estimated at 100,000 acres, within the Old Sea-dyke bank, has long been an object of embankment. Ravenbank, the origin of which is quite unknown, appears to have been the third bank which had been formed for securing a small part of this tract from the sea, leading from Coult to Tidd St. Mary's. About six miles nearer to the sea is another bank, called the Old Sea-dyke bank, which is unquestionably a Roman work.

A very curious circumstance is, that a fifth bank, called the New Sea-dyke bank, two miles nearer than the Roman one, remains, but it is utterly unknown when or by whom it was made. The new bank mentioned above, takes in about two miles more in breadth. In taking the levels for making the new drain, it was found that the surface of the country, on coming to the Roman bank, suddenly rose six feet, being six feet higher on the sea side than on the land side, and then continued on that higher level, being the depth of warp, or silt, deposited by the sea since that bank was made.

The first navigable canal that was made in England, is, in all probability, that which was made from Lincoln to Torksey: it is evidently a part of the Cardike, an immense Roman work, which served to prevent the living waters from running down upon the fens, and, skirting the whole of them, from Peterborough to Lincoln, afforded a navigation of the utmost consequence to this fertile country.

7017. RUTLANDSHIRE. 91,000 acres, resembling in soil and surface the uplands of the adjoining county of Lincolnshire. The western part of the county is under grass, and the eastern chiefly in aration. The soil is almost every where loamy and rich; and the agriculture partaking of that of Lincolnshire and Leicestershire. The operative classes seem more comfortable in this county, and more humanely treated by the proprietors and farmers than in many others. The Earl of Winchelsea has made great exertions to this effect. (*Cruckley's Report*, 1794. *Parkinson's General Review*, 1808. *Marshal's Review*, 1812.)

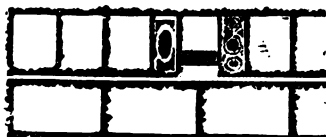
1. Buildings.

Some comfortable cottages built by the Earl of Winchelsea, containing a kitchen, parlor, dairy, and cow-house, &c. with two bed-rooms over.

Others for three cows, and with a calf-house, piggery, dairy, kitchen, living-room, and two bed-rooms over.

A third sort the operatives inhabit a crew, containing a kitchen, pantry, closet in the stair over, and two bed-rooms, one with a fire. Several with small farms of from five to twenty acres attached. (*fig.* 793.)

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2. Arable Lands.

Generally better managed than in Lincolnshire, and very productive. The barley said to be of very superior quality.

3. Pasture.

Chiefly upland. The culture of letting part of it to laborers, and also of taking in laborers' cows at so much per head, prevails, and is encouraged by the Earl of Winchelsea.

4. Several Orchards.

In several places the cottagers take small portions of fields from the farmers to use as gardens. At one place, three acres and a half is divided into fourteen gardens, and at Oakham a field of three acres is divided into twenty-four gardens, and let at five shillings per garden.

5. Improvements.

Parkinson, one of the reporters, and a man of sound judgment, has altered his opinion on the subject of irrigation, and says it is now in conformity with that of a correspondent who

Some irrigation; and rearing, on the Humber, where, as already described, (4117.), it was invented.

9. Live Stock.

More attended to in this county than the culture of corn. The Durham short horned cattle are preferred, but any sort fatten well, and there is little dairying.

Sheep. County carries one sheep and a half per acre at an average. Lincoln breed preferred, Leicester much tried, and crosses between them frequent; upon inferior land the Leicester preferred, as fattening easier; since the enclosure no folding; several ram societies.

Horses. Of the heavy black kind a good deal bred both for carts and coaches; in various places saddle horses also; some farmers keep their horses all the winter in open sheds, with littered yards for them to go out and in at pleasure. Ground-eaten, said to cure the grease; oats mixed with salt water given for three weeks or a month, found preferable to spring physic.

Rabbits. Several warrens on the wolds.

Geese formerly much kept in the fens, and plucked four or five times a year. "The feathers of a dead goose worth six-pence, three shillings a pond. But plucking alive does not yield more than three-pence per head, per annum. Some wing them only every quarter, taking ten feathers from each goose, which sell at five shillings a thousand. Plucked geese pay in feathers one shilling a head in Wiltshire fens."

10. Political Economy.

Roads in many places made of clay; "dreadfully dusty and heavy in dry weather; on a thaw or day's rain like mortar." A number of canals, and, as already observed (3530), the first in England made from Lincoln to the sea. A fabric of brushes and sacking at Gainsborough; flax spun in various places. An agricultural society at Falkingham, established in 1796.

this writes to him:—"In my opinion watering renders the quality of the herbage and the land the worse for the process. Where land is tolerably productive, and in a situation where a quantity of grass food is not required, I should certainly not advise it. I think the land may be turned to better account without it. But I think there are many situations, particularly on gravel, sand, or open soils, where it may be very advantageous; the produce, by such means, is certainly much increased, and, in some instances, rendered larger when very little other work would be produced. Though the produce is increased, yet it becomes in time, in a few years, of so coarse a nature, and mixed with rushes and plants, that cattle frequently refuse to eat it; and when it is eaten, the appearance of the cattle proclaims it far from being of a nutritious nature." He adds, "I was formerly an advocate for irrigation, and am still on such soils as are described in the above extract; but having had since opportunities of viewing several water meadows which have been of long standing, which have operated to the disadvantage of both the herbage and land, I have been obliged, in a great measure, to alter my opinion."

6. Live Stock.

Not much breeding, but chiefly feeding. P. considers that much depends on the application to fallow, and is of opinion, that the large Durham ox did not eat more food to raise him to that enormous size, than some others would to bring them to half the size or weight at the same age. Nor is it at all probable, that Lambert, of Leicester, who arrived at such an astonishing weight, had eaten more food than Powell, the celebrated pedestrian, who was a very thin man. An animal for the shambles is seldom too large if he has an aptitude to fatten; and much depends on the constitution of an animal in this respect.

A good plan for washing sheep at Burleigh; but not so simple as the Duke of Bedford's.

Horses of a very heavy, slow, unprofitable sort are raised in the county.

Of bees, 1176 hives kept by the cottagers.

7. Political Economy.

The Leicestershire and Rutlandshire Agricultural Society established in 1806, meet at Melton Mowbray, and Oakham, alternately. Less want of knowledge in this county than in most others.

7018. NORTHAMPTONSHIRE. 617,600 acres of billowy surface, rich in wood lands and pasture lands, but much behind in the culture of corn. The soil is almost every where excellent; and by the introduction of good husbandry, the marketable produce of the county might be amazingly increased. (*Donaldson's Report*, 1794. *Pitt's Report*, 1806. *Marshal's Review*, 1812.)

1. Geographical State and Circumstances.

Climate. Favorable both to health and vegetation; exempted from deep falls of snow and long-continued rains; highest point in the county supposed about 800 feet above the level of the sea, and there is neither mountain nor bog. Donaldson found that wheat harvest generally commences here about a fortnight earlier than in Fifehire.

Soil. Great part on a calcareous bottom, limestone, schistus, or slate, and the remainder of sandstone. The surface earths may be classed as strong sand, deep loam, light thin reddish soil, thin light clay, and fat and meadow.

Minerals. Clay, limestone, mast, freestone, and slate.

2. Property.

Almost wholly in large estates; thirty-seven of or above 3000*l.* a year, half of which are from 5000*l.* to 10,000*l.*; managed by stewards.

3. Buildings.

Athorpe, Burleigh, and Castle Ashby, noble mansions. Farm-houses "as badly constructed as improperly placed;" built of stone or brick, and covered with slate or straw; farmers and their families crowded together in towns and villages; cottages of mud and thatch.

4. Occupation.

No large farms; 150 acres the average of open fields, and 200 the average of inland farms; few or no leases.

5. Implements.

"A tough and clumsy piece of work, with a long mossy beam and timber mould, being drawn by four or five horses in a line." Donaldson says, a small plough, with two horses abreast, will make better work; but Pitt (who seems to know very little of the matter) joins with Smith, of Tuchmarsh, who says, "I have heard and read much on the subject, and tried a variety of ploughs, but it is ridiculous to assert that a horse can plough abreast in almost any part of this county. I have met with no ploughs which serve so well (!) or run so easy as the ploughs in common use." So much for the ignorance and presumption of Farmer Smith, and the prejudiced opinions of Pitt the reporter. A ribbed or plated roller, formed by letting in sixteen bars of iron lengthways of the roller, is found preferable either to a spiky or smooth roller for breaking clods.

6. Arable Land.

Fallow, wheat, and beans the common rotation, but others which include turnips and clovers, beginning to be introduced.

on the light lands. Most of the other plants in cultivation tried by amateurs or others. Wood cultivated by two wood growers, who live in the county; it requires rich old pasture land, far more than 54, to 71, per acre per annum, for two or three years, the farmer being compelled to give it up for that term, and to take it to again afterwards, at the old rent. The land is ploughed early in spring, well harrowed, and sown broadcast, as thick as grain, by hand-fuls; a great deal of harrowing and dressing is necessary to bring it to fine tilth. When the plants appear they are hoed, and kept perfectly clean, in a garden style of culture, and the crop appears somewhat like a broadcast crop of spinach; the leaves are gathered by hand, in baskets, three times in a season, (except a plot sometimes saved for seed) and carried to a mill, where they are ground to a pulpy mass, by vertical wheels, crossed with iron plates, and moved round by horses: this pounce, or jelly, is then formed into balls, by hand, and dried on hardies, in a shed; these balls are afterwards broken up, and fermented, and finally dried in small tumps, somewhat resembling horse-dung in color and appearance; it is then packed up in casks for use.

Owens cultivated to great perfection about Northampton; 190 quarters known to have been sent to Coventry fair at one time.

Tobacco cultivated by some farmers for the purpose of dressing sheep for the scab, and for two or three years, as here as possible, and finally dried in small tumps, somewhat resembling horse-dung in color and appearance; it is then packed up in casks for use.

7. Grass.
Supposed to cover 375,000 acres; 40,000 acres in meadow, on the borders of the Nen and other rivers. One farmer says "a great improvement on all mowing-meadows, incapable of being watered in, to grass, once in two or three years, as here as possible, and finally dried in small tumps, somewhat resembling horse-dung in color and appearance; it is then packed up in casks for use."

8. Gardens and Orchards.
Good market gardens and orchards about Northampton; all common articles grown there well, but melons, grapes, peaches,

7019. YORKSHIRE, 3,698,380 acres divided into three Ridings, each of which is as extensive as the generality of other counties.

7020. WEST RIDING OF YORKSHIRE, 1,568,000 acres of irregular country, hilly and mountainous towards the north and more level on the east. It contains a great extent of surface well adapted for husbandry, and is the seat of large and extensive manufactures. A survey of this Riding, of singular ability and interest, was made by three Scotch farmers; and the reprinted copy, as it contains the notes of several gentlemen of the county, will in future times be considered as a curious document; displaying as it does local opinions so different from those considered as liberal and enlightened. (*Brown's West Riding, 1799. Marshal's Review, 1818. Smith's Geological Map, 1821.*)

1. Geographical State and Circumstances.
Climate, moderate and healthy, excepting on the low surface near the Ouse; rain at Sheffield about thirty-three inches in the year.

Surface irregular, but the middle and eastern parts nearly level; arable lands generally enclosed with walls and hedges.

Soil various, from deep strong ley to peat.

Minerals. Coal, lime, ironstone, lead, and some copper, which have been wrought for ages past.

Rivers. Ouse, Don, Calder, Aire, and Wharfe, all considerable, besides others of less importance.

2. Property.
Much divided, but some large estates, as those of the Duke of Northolt, E. Fitzwilliam, Lord Harwood, &c.

3. Buildings.
Wentworth House one of the largest and most magnificent in the kingdom; had formerly been a castle, and is situated in most English counties; Lord Hawke has erected a commodious and elegant farm for his own use. Great want of cottages for farm operatives.

4. Occupation.
Farms small for one of 400 acres, a dozen under fifty; occupier of 100 acres styled a great farmer; few leases; the tenants on one estate driven off because they had become restless; tenantry in general much plagued by attorney stewards, who must have business or make it.

5. Implements.
Rotherham plough general over the whole district, but one horse cart and other improved implements as well as better ploughs are wanting.

6. Arable Land.
Round many manufacturing towns, great part of the land held by manufacturers, that by farmers not well managed compared with Scotland, but tolerable compared with other districts of England. No grain will ripen on the eastern moorlands at an elevation of 800 feet; but on the calcareous wolds of the East Riding, it ripens considerably, and at 500 feet better than here at 800. Such is the effect of a calcareous soil. Besides the usual crops, some flax, rape, liquorice, rhubarb, and weld cultivated. Some excellent remarks on fallows.

7. Grass.
Great part of the county under old pastures, including some meadows, chiefly applied to the feeding of horned cattle; cat-

tle and pine apples to be had from London, cheaper than they can be grown in the county.

8. Woods and Plantations.
Very extensive; there are forests, chases, park woods, and woods and plantations being freshhold property. Rockingham forest the most considerable, nearly twenty miles in length, and covering 8 or 10,000 acres. Whitewood eleven miles, and 7000 acres, with Salcey forest, making in all 30,000 acres: the chases and other classes are supposed to amount to 80,000 acres more, making in all 40,000 acres of woodland in the county. The forest lands are in general very unprofitably managed; the Crown has a right to the timber, the Duke of Grafton and others to the underwood, and the township to the pasturage, &c.: 1) Woods which are private and entire property, are better managed.

10. Live Stock.
Cattle of the country, the long horned breed, but various; others introduced for fattening and the dairy.

Sheep of various breeds; a good many new Leicesters.

Horses of the strong black breed, bred for the coach, the army, or large waggons. Blood horses formerly bred, but lost off, as the best breed renders them unsuitable.

Pigs, a breed between the Berkshire and the Tongue.

11. Political Economy.
Bad roads but many handsome bridges; some canals. Manufactures;—shoes for the army and navy and exportation, bone lace, woollen stuffs, as tanneries, callimancoes, and everlasting.

Several small friendly societies for the promotion of agriculture, consisting chiefly of farmers. The Lampport society is one of those which was founded in 1797, meets at Lampport; it has a fund for purchasing books on agriculture and domestic economy, and seems to be a description of association very commendable. A great source of improvement would be the bringing up of the inferior grass lands and the temporary laying down of the continually cropped tillage lands. Donalson has drawn an able comparison between the management of lands in the County of Gloucester in Perthshire and those of Northamptonshire, which shows how very far behind the latter county is in arable culture.

generally made fat on grass and finished by stall feeding on turnips; sheep sometimes fed on turnips, by harding. Grazing much better understood than aration.

8. Gardens and Orchards.
A particular species of plum grows at Sherborne, and in the neighborhood, called the winecrop. It grows well both upon gravel and limestone, is hardy, a good bearer, and answers upon any soil; but does not bear so well, nor its flavor so good on any as on limestone or gravel. On a strong deep land, the trees run too much to wood, and do not bear fruit in proportion. These plums blossom better than any other sort, and are produced from suckers. The fruit sells from 21s. per peck, when sound and good, to 4s. 6d. when cracked and damaged. They are easily hurt by rain. Plants are to be had from most public nurseries, and in gardens they should be planted on a layer of lime or chalk.

9. Woods and Plantations.
Much oak and ash wood grown, and a ready market found at the shipping and manufacturing towns.

10. Waste Lands.
Two hundred and sixty-five thousand acres capable of cultivation.

11. Improvements.
Warping the most remarkable; ably described by Lord Hawke, and Day of Doncaster.

12. Live Stock.
A great variety of breeds of cattle and sheep in use, but no one generally preferred. Near Leeds, when milk tastes of turnips a few cups of dissolved nitre is put among eight gallons of milk, which entirely removes the flavor. Horses generally used in draught, not many bred except in the northern part of the district; sort in use among the farmers a small hardy race.

13. Political Economy.
Many good and many bad roads, various canals. Numerous manufactures of shalloons, callimancoes, flannels, and every branch of woollen goods. A Sheffield every kind of cutlery, since Chaucer's time; at Rotherham iron-wares. These and other manufactures the cause of the wealth of the West Riding.

14. Means of Improvement.
Leases, division of commons, enclosing of wastes, better relations, &c.

was formerly extracted from them, but as it required a good deal of coal, and pyrites are equally abundant in the coal at Newcastle, the manufacture of sulphur was transferred to the latter place. Some coal and iron-mines in the moors, but not much worked; also copper, lead, freestone, slate, marble, &c. little worked or abandoned.

2. Property.
One third of the Riding possessed by yeomanry; rest of estates from 5000. to 18,0000. per annum; many gentlemen's seats and the proprietors reside most part of the year on them; tenants mostly freshhold.

1. Geographical State and Circumstances.
Climate dry like that of other districts bordering on the German Ocean. Cold east winds during the first half of the year. Milder in June, when west winds begin to prevail; vegetation not vigorous till June.

Soil and surface: on the coast clay, and lightish soil on alum strata; a loam upon freestone, and in some valleys west of Whitby a deep rich soil: of Cleveland fertile chalk and surface hilly; vale of York generally of a rich soil.

Minerals. Inexhaustible beds of alum in the hills of the coast and Cleveland; and the only alum works in the island carried on there; pyrites being found in the alum mines sulphur

3. Buildings.

Mansions and farm-houses, as in the West Riding, but rather inferior; cottages decidedly inferior; small and low, rarely with two rooms; damp and unwholesome hovels. Close wainscoted beds used, as in the poorer parts of Scotland, which are sources of insects and infection, and every way unwholesome.

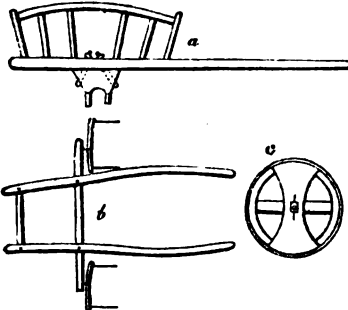
4. Occupation.

Farms on the whole small, many very small; farmers sober, industrious and orderly; most of them have been educated, and educate their children. Few leasars.

5. Implements.

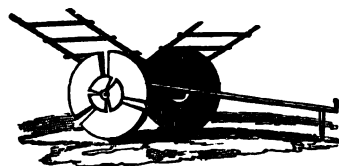
Rotherham or Dutch plough: hay sweep for drawing hay together, with a horse, and a simple sort of cart (*fig. 794 a.*) in

794



use, formed almost wholly of timber, and to be drawn by one, two or three horses abreast (*b*); wheels entirely of wood (*c*); when to be emptied, the shaft horse is taken out, but not the others. Another variety for harvest work (*fig. 795*.)

795



6. Arable Land.

In the vale of York one-third in tillage; about Cleveland one-half; on the moors much less. Culture and rotations as in the West Riding. Rye more frequently sown than wheat on the light sandy soils; often mixed with wheat, and then called Meslin.

Tobacco much cultivated a few years prior to 1782 in the vale of York and Ryedale. In the latter district it did not excite the notice of regal authority; and was cured and manufactured by a man who had formerly been employed upon the tobacco plantations in America; who not only cured it properly, but gave it the proper cut, and finally prepared it for the pipe. But in the vale of York the cultivators of it met with less favorable circumstances. Their tobacco was publicly burnt, and themselves severely fined and imprisoned. Penalties, it was said, were paid to the amount of thirty thousand pounds. This was enough to put a stop to the illegal cultivation of tobacco. But, perhaps rather unfortunately, it has likewise put a stop to the cultivation of that limited quantity of physic and chirurgery, or destroying insects.

Mustard grown in considerable quantities in the neighborhood of the Riding. It is prepared for use in the city of York, where there are mills and machinery for the purpose; and it is afterwards sold under the name of Durham mustard; sown either on land pared and burned, or prepared and manured as for turnips. Seed, one to two pecks per acre broadcast, in the early part of May. No culture whilst growing, except hand-weeding, if necessary. Shorn with the sickle in September, and generally stacked in the field, and threshed out upon a cloth, at the convenience of the farmer. Two quarters per acre is thought a good crop.

Teasle grown on strong soils; seed, two pecks a little before May-day; surface dug or forked over in June, October, and Lady-day; reaped in August; 10 pecks an acre a good crop; each pack 1350 bunches, of ten teasles each; price, 3 to 5 guineas per pack.

7. Grass.

Old pastures and meadows very badly managed; uplands overrun with moss and ant-hills; meadows with rushes; and so neglected, that what would be worth 2000, under a proper course of husbandry, is dear at 7s.; chiefly devoted to the dairy.

8. Gardens and Orchards.

Have made but little progress in this Riding owing to the

want of manufacturing towns to create a demand; farmers' gardens, as in most places, much neglected.

9. Woodlands.

Of small extent; a good deal of timber in hedgerows in various places.

10. Live Stock.

Short horned cattle chiefly prevalent. Stall feeding carried to less extent than dairying. Cows taken in at Martinmas, and fed on turnips, and straw or hay if there are no turnips; butter chiefly made and salted in firkins, and sold to the factors, who ship it to London; a good many cows brought up for London, and any surplus sold for the Lancashire graziers.

Sheep. In the bleaker parts, the Cleveland breed, large coarse boned slow feeders, and the wool dry and harsh. All the new breeds introduced, and several professed ram breeders in the vale of York.

Horses. This Riding long famed for its horses, particularly those of Cleveland. In the northern part of the vale of York a light breed for saddle and coach; in Cleveland, a fuller boned horse, very strong and active, and well adapted for either plough or coach. In all the other districts horses are generally bred; on the western moorlands Scotch galloways are put to the stallions of the country, and rear a hardy and strong race in proportion to their size. Before the war mares were bred and sent to the West Indies. Some farmers do not breed, but buy colts and work them till four or five years old, and then shoe them for the first time, and sell them to the London dealers for coach horses.

The farmers who breed horses, generally breed from those mares which are employed in the business of the farm; these are often worked until the very time of foaling, after which they have usually two or three weeks rest, before they are again taken to work; the foal, during the time the dam is working, especially whilst it is young, is shut up in a stable; and it is the practice of some before she is suffered to go to the foal, after returning from work, to bathe her udder with cold water, and to draw most of the milk from it, to prevent the milk, which may have been heated by labor, from having any hurtful effect upon the foal. Some continue this practice as long as the foal sucks; others, after the foal has got sufficient strength to travel along with the mare, take it along with her into the fields, and frequently suffer it to suck, from an opinion, that by the milk being frequently drawn, less danger arises of its being heated, or of possessing any quality prejudicial to the foal. The general time of foaling is about May-day (from which day the age of all horses is reckoned), and that of weaning, about Michaelmas, when the foals are put into good after-grass, or the best pasture the farmer possesses: they remain there as long as the weather permits (if there be sufficient food), and on the approach of winter, have a little good hay given them, so that there is a store of food, that they can go into at their pleasure. The colts are usually gelded in the spring following, and in summer are allowed only an inferior pasture; the next winter they make their living in the fields, or in the straw-yard, except they are intended to work in the spring, which is frequently expected of those of a strong kind: such are rather better kept at the time of labor draws high, and are only put to light and easy work, and generally work only half a day at once. Some keep their colts a year longer, before the operation is performed, and find that such become the stronger and handsomer horses. The foals always receive a great check by being weaned, which it does not well recover before it gets the fresh pasture of the following summer. The foals which are gelded at one year old, receive a second check, at the very time they should begin to recover from the first; whereas, at two years old, they appear to be in the best condition for the operation, and recover at least as well as at one year old, and are much improved by the keeping of the preceding year.

Exportation of horses. The horses which are sold for the London market, if for the carriage, are chiefly bay geldings, with but little white on their legs and faces, those which have much white, with chestnut, roan, and other unusually colored horses and mares, generally do not bear an equal price in the London market; but with other slight and undervalued horses, are more sought after by foreigners, and eagerly purchased by them for exportation; or are exported by people of this country, who carry them to the foreign markets, and ultimately obtain a price equal to that obtained for those sold at home; by these means the exportation, contrary to an usually received, but ill founded opinion, has a strong tendency to reduce the price of those horses which are calculated for the home market; and since as many fillies as colts are naturally bred, and one-third of the colts at least will either have too much white for the home market, or be of some other color than that which is fashionable at the time, if the breeder had not a market for those, which appear to be two-thirds at least of all he unavoidably breeds, he would be compelled to put such a price upon the one-third which happens to suit the home market, or variable taste of the moment, as would pay for the other two-thirds; which last would either be unsaleable, or fetch very inadequate prices. The consequence naturally flowing from this would be, that the price of horses used at home would be far greater than at present, when a foreign demand procures to the breeder nearly as good a price for those horses, which otherwise be useless and unsaleable, as for those which are valued at home.

Rabbits are kept in one or two warrens; in one the silver grey is kept; the skins of this variety being worth double those of the grey; not used for felt like the common skins, but dressed in furs, and exported to China to be worn by the Mandarins.

11. Political Economy.

Roads in an improving state; bridges better attended to than in most counties; but guide-posts neglected, which an annotator on Tuke's report justly remarks, is a sort of reverting to barbarism; as an attention to these sort of minutiae is one of the most striking marks of civilization. Various manufactures of sail cloth and cordage at Whitby and Scarborough; at various places in its neighborhood, alum works: 4000 tons of this article annually shipped from Whitby; linens, cottons, woollen, and paper manufactured in various places.

7022. EAST RIDING OF YORKSHIRE 819,900 acres of moderately wavy surface, intersected with numerous deep winding valleys; not remarkable either for its arable lands or pasturage; but productive of horses for the coach and saddle, and of the excellent Holderness breed of cows. (*Leathes's General View*, 1794. *Strickland's View*, 1812. *Marshall's Review*, 1812. *Smith's Geological Map*, 1821.)

1. Geographical State and Circumstances.

Climate of the wolds severe and variable; N. and N. E. winds prevail in winter and spring; in the vales milder; mild, but not very healthy, on the Humber; rain at Hull, twenty-seven inches and a half yearly at an average.

Soil of the wolds calcareous loam; of Holderness, fertile clay and stiff retentive clay. On the banks of the Humber, from Paul, nearly to Sperrit Point, there are thirteen or fourteen thousand acres of warp-land, of a strong clayey loam, the productiveness of which can hardly be equalled.

Sunk Island on the Humber is a modern creation by that estuary: it first began to show itself about 1667, at ebb tide, and as no man pretended title to it (it being a detached island), a grant of it was made by the crown in the same year. In 1787, 1600 acres of the land were embanked and under tillage, producing a rental of 900*l.* a year, with a chapel and several farm-houses erected on it. That part of Sunk Island which was first embanked, was originally about two miles from the shore, and many persons are still living who recollect vessels passing between it and the mainland, to which it is now united by a bridge across a narrow channel, serving as a drain to the adjacent country. It contains at present within the banks about 4700 acres, and twenty-four families, and is continually increasing in size, an extensive tract having been recently embanked, with a probability of its being still further enlarged.

Minerals. Chalk and a very hard shelly limestone, producing a lime little valued either by the farmer or builder. Chalk of the wolds much harder than that of the southern counties. Marl in many places. Gypsum in some places, but no mineral veins or coal, and in many places not even clay for bricks.

2. Property.

Less divided on the East Riding than in other parts of the county; perhaps less than in most parts of England, which arises a good deal from the nature of the soil; one half of the wolds where land is held in little estimation, and occupied in larger tracts; the other a flat low country, partly rich and clayey, and partly sandy and barren. Most of the families have possessed their estates for many centuries, and some from the Norman conquest; largest 15,000*l.* a year, ten at 10,000*l.* a year. Only three noblemen have seats in this Riding.

3. Buildings.

Seventy-four manorial houses, of which twelve are going to decay, nineteen let to tenants, or ninety-eight; forty-one occupied by their owners (*Temp. Eliz.*); remain twenty families bearing arms resident in the county.

Farm-houses generally good, excepting on the wolds, where they are built of chalk, thatched, and miserably bad; generally in villages, excepting those built lately.

Cottages more comfortable than in many places, generally two rooms below and two bedrooms over them; a disposition in the proprietors to let their cottages go to decay.

Village cow clubs. A plan for insuring cows having been lately adopted on an extensive scale, and with striking success in the north of Lincolnshire, from which it appears that an average payment of about three half-pence per cow per week, (or six shillings per year,) is fully adequate to replace the ordinary losses of cows by death; it is proposed to institute a similar club in the antiquitous parts of the East and North Ridings of Yorkshire, with a view of securing to the laborer and his family at a trifling expense, the great benefits of that useful animal, without his risking more than one-sixth part of his value, upon certain conditions.

4. Occupation.

Farms in general small; one or two of 1800*l.* per annum, but from 300*l.* to 200*l.* more common. Leases so rare that the surveyor could not recollect of one, unless under suspicious circumstances, where something incorrect is aimed at: some advantage intended to be given or taken: where either the landlord wanted something more than customary from the tenant, or the tenant was disinclined to trust his landlord: great estates are let in full confidence in this Riding, where a lease was never asked for, probably never wished for; because the tenure is equally secure, and more permanent without than with one. Many estates have been occupied by the progenitors of the present tenants, during two, three, or four generations.

5. Implements.

Waggons here of a bad construction; but well yoked in the German manner. The four horses are yoked two abreast, in the same manner as they are put to a coach, two drawing by the splinter-bar and two by the pole; those at the wheel drawing also by a swinging bar, which the wheel horses of every carriage ought to do, as they thereby obtain considerable ease in their draft, and are less liable to be galled by the collar than those which draw by a fixed bar; the driver then, being mounted on the near side wheel horse, directs the two leaders by a rein and the followers by one of their bridles, they being coupled together by a strap passing from the inside of each of their bridles to the collar of the other horse. In this manner when empty, they trot along the roads with safety and expedition; and when loaded, the horses being

near their work, and conveniently placed for drawing, labor with much greater ease and effect than when placed at length. Were the waggon indeed of a better construction, the team would be excellent.

The pease hook, and the bean hook, both made out of old scythe blades and used in reaping pease and beans, are peculiar to this Riding; as was the lime burner's fork till lately. (See figs. 527 b, c.)

The moulding sledge is a useful implement for levelling the small inequalities of meadow and pasture land, and spreading the dung dropped by the cattle. It is a frame of wood about five feet square (the sides of which are about four inches thick to give it weight and strength), having three bars of iron fixed to the lower side, the points of which are thinned to sharp edges. When in use, some thorns are drawn under the hinder wooden bar, and above the middle one, to which they are fixed by cords. If it is wanted to be removed from one field to another, it is turned the other side up, which preserves the edges of the bars from injury. It is drawn by two horses, and will go over a great extent of land in a day.

6. Enclosing.

The taste for this has been carried too far, and land enclosed which has not and probably never will repay the expense.

7. Arable Land.

Two-thirds of the wolds and one-third of the rest of the Riding under the plough; fallow, wheat, oats; or fallow, barley, beans, common rotations.

8. Grass.

The marshy meadows adjoining the Derwent, a few grazing pastures in Holderness and Howdenshire, and the small garths or paddocks in the immediate vicinity of the towns and villages, form the principal part of natural grass land.

The salt marshes on the outside of the embankments are of no great extent. Unless the mud is so elevated as to be constantly above water for a few days at neap tides, no plants take possession of the surface; but when vegetation can go on, the first plants which take possession are the salticornia or samphire, and next the pea maritima, which in a short time covers the surface with a close short sward. A few sheep are occasionally put on it when not too much dirtied by the mud of the spring tides.

In laying land to grass cutaway and parley sown among it by sows, to preserve the health of the sheep.

9. Gardens and Orchards.

Almost unknown, excepting among the higher classes; farmers rarely use any other vegetable than potatoes and turnips; cottagers cultivate their gardens with more care than the farmers.

10. Woodlands.

Of no great extent in proportion to the Riding; extensive plantations made on the wolds.

11. Improvements.

Holderness drainage an extensive work of the kind on the east side of the river Hull; it extends over nearly 12,000 acres, and is managed by commissioners. Various other extensive drainages.

12. Live Stock.

Cattle of the Riding, remarkable for their large size and abundant supply of milk, prevail universally. Their breed is supposed to have been introduced from Holland about a century ago, and improved by attentive management. The late Sir George Strickland the greatest modern breeder in the district. Breeding a principal object in most parts of the Riding, and feeding in Holderness when the pastures are rich.

Sheep formerly the Holderness breed, resembling that of Lincolnshire and the Wold sheep; now the Leicester and various other breeds.

Horses for the coach and saddle, the grand branch of breeding in this Riding, and as many or more produced in proportion to its extent than in any other. But it is allowed by all that the breed has of late much degenerated, owing to the institution of the farmers. About twenty years ago a cross of blood was introduced, by which, though good saddle horses were produced, the coach horse was lost. This error discovered, an opposite and still more pernicious error was produced by the introduction of heavy black stallions from Lincolnshire. These produced a mongrel breed which will not be got rid of for several generations. In breeding, some castrate the stall while suckling, and think it a preferable practice to that of the North Riding.

Rabbits. About twenty warrens, containing together probably 10,000 acres.

13. Political Economy.

More than 140 miles of turnpike road in the whole Riding; few of these good, and the cross roads and lanes very bad; manufactures few; white lead, glue, glass, iron-foundry, oil-mills, cordage, saltpetre, patent whalebone, brick, tile, pottery, &c. at Hull. White lead, and greenish white for whitening prepared from chalk, at Hessel. Howden coarse canvas for mail bags; near Driffield spinning and weaving tow; other manufactures near York. Several agricultural societies; one for books and implements at Howden.

7023. DURHAM. 582,400 acres of surface, in some places mountainous and in most places hilly; the soil in great part poor; the agriculture generally approaching the best model, that of Northumberland, and the county distinguished by the Durham or Teeswater breed of cattle, and by its lead and coal mines. The celebrated farmer and breeder, Culley, was a native of this county, and farmed here as well as in Northumberland. (*Granger's General View*, 1794. *Baily's General View*, 1810. *Marshall's Review*, 1812. *Smith's Geological Map*, 1824.)

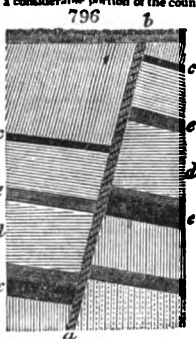
1. Geographical State and Circumstances.

Climate late and mild in the lower districts, but on Crumfield, the highest land in England, being 3400 feet above the level of the sea, snow frequently lies from November till the

middle or end of June. General time of harvest from the beginning of September to the middle of October.

Soils principally clay loam and peat; the latter prevails in the western part of the county or lead mine district; there is a tract of calcareous soil in the interior of the county.

Minerals: coals found over a considerable portion of the county, workable to the extent of 100,000 acres; these in the northern parts of the county wrought for exportation, in the western and southern parts for land sale only. In various parts of the coal districts are dykes or fractures, (fig 796, a, b,) and consequent derangement of the strata, which throw the beds of coal (c) on one side of the dyke often many feet up or down. The fissure between being commonly filled with clay, stops the water in its course along the different bed (d, e,) interrupts the drainage, and greatly damages the working of the coal.



Lead mines numerous in the west-*ern* district; the ore mostly in vertical fissures of limestone and other rocks like the dykes.

Milstones, grindstones, freestones, slates the grey or freestone kind, silver sand, limestones, whinstone, clay-stone or black metal stone, and yellow ochre, also found.

Water. Salmon fishery on the Tyne has greatly declined, owing to the building of weirs, which prevent their getting up. Bailey remarks, that if dams of this description were put across the river Tweed a revenue of nearly 16,000*l.* per year, received for rents of fishings, and 60,000*l.* a year the value of the fish taken in that river, would be reduced to a mere trifle, in a few years.

Salt springs, from which salt is made near Britt and other places. A sea or salt water spring near Durham, and another on J. G. Lambton's estate with public baths and drawing rooms. Various others of less note.

2. Property.
Largest estates, 20,000*l.* to 22,000*l.* a year; several from 1000*l.* to 2000*l.* from which they descend by regular gradations to the smallest sums. Some estates let by proposal, but the general mode is to ask a rent, and treat with tenants six or seven months before the existing leases expire.

3. Buildings.
Generally of stone and slate; cottages of one story, covered with thatch or tiles.

4. Occupation.
Largest farm about 1000 acres, greatest number from 150 to 50 acres. The larger farmers, almost only those who have made improvements; among these, Messrs. Culley and Charge first led the way, and have been followed by Messrs. Collings, Mason, Taylor, Trotter, Nisbarn, Seymour, and many others, by whose exertions and judicious selection of stock this district will be lastingly benefited.

Greatest number of small laboring farmers greater slaves than their servants, being generally employed through the summer, in some kind of work or other, from four o'clock in the morning till eight at night; and in every other season of the year, from twilight to twilight; and may truly be said, "to rise early, take rest late, and eat the bread of carelessness."

Leases, three, five, and seven acres, excepting church and corporation leases for 21 years, and lives. Those farms let for short terms resemble a lottery; of no prudent man will let out his money in improvements, for which, when completed, he will be rewarded by an advance of rent, proportioned to the improvement he has made.

5. Implements.
Tying ploughs of the Rotherham kind; of late the Smalls

7094. NORTHUMBERLAND, including those detached parts of the county of Durham, called North-shire, Islandshire, and Beddingtonshire, comprehends a surface of 1,267,200 acres, chiefly mountainous or breeding districts, but including 450,000 acres proper for tillage. The celebrity of this county both for its tillage and breeding is well known. Here turnips were first extensively cultivated in the drill manner, and the best principles of breeding practised by Culley. To this gentleman and Bailey agriculture owes much: the latter was perhaps one of the most enlightened and accomplished of modern agriculturists. (Bailey and Culley's *General View*, 1805. *Marshall's Review*, 1808. *Smith's Geological Map*, 1824.)

1. Geographical State and Circumstances.
Climate subject to great variation of temperature; snow to a considerable depth on the mountains, when there is none in the lower districts; weather runs in extremes; very cold in spring, and seldom mild before June.

Soil and Surface. Fertile loam along the coast; sandy, gravelly, and dry loam on the Tyne, from Newbarn to Halt-whistle, on the Coquet about Rothbury; on the Ails, from Alnwick to the sea; down Tweeddale, but chiefly in the vales of Breamish Hill and Beasmont. The hills surrounding the Cheviot mountains are mostly a dry sharp gravelly loam. Moist loam occupies a large portion of the county, unsuited for sheep, and unfit for turnips, and peat earth prevails in the mountainous districts.

The aspect of the surface is marked with great variety; along the sea coast it is nearly level; towards the middle more diversified, and thrown into large swelling ridges, formed by the principal rivers. These parts are well enclosed; in some places enriched with wood and recent plantations, but the general appearance is destitute of those ornaments. The western part (except a few intervening vales) is an extensive scene of open mountainous districts, where the hand of cultivation is rarely to be traced. Of the mountainous districts, those around Cheviot are the most valuable, being in general fine green hills, thrown into numberless variety of forms, enclosing and sheltering many deep, narrow, and sequestered glens.

Minerals. Coal in abundance in the greatest part of the county: it is like that of Durham of the calking kind, and is found in the south-east quarter of the best quality; quantity exported, chiefly for the London market, 956,450 London

plough; various other good implements, and in many parts now (1823) the improved forms of Northumberland and Berwickshire.

6. Enclosures.
On dry soils hedges are frequently planted on a raised mound, forty inches broad, and the height twelve inches, a small ditch is cut on each side to make it, and the quicks are planted in the middle. In this mode the land may be ploughed nearly to the mound, and when the thorns are grown to a sufficient height, almost close to the hedge. When they are five or six years old, every other stem is cut clean off, within two or three inches of the surface, and the remaining ones stripped of their principal branches; then stakes of thirty inches high are driven in at proper distances, and the splashing stems, having a slight cut on one side to make them bend easier, are wound amongst the stakes at an angle of about twenty-five degrees, and a single edder is wound round the top to keep the stakes tight.

7. Arable Lands.
Ploughing generally well executed, but in some places the subsoil prevents sufficient depth of furrow, i. e. six inches. The turnip culture, rotations, and general management of arable land, the same as in Northumberland; that is of the most improved kind; seventeen tons of ruta bags are equal to thirty-one tons of white turnips in feeding cattle or sheep.

Mustard was formerly much grown in this county, and Durham mustard was proverbial for its excellence. At present a crop of mustard is rarely met with. It is generally sown upon pared and burned land in April, one pound per acre. The produce about twenty bushels per acre; and price from eight to sixteen shillings per bushel.

Potatoes in the village of Harneastly have been the principal article of trade, and the principal employment of several families for eighty years; they are very particular in having good sets, each with two eyes; use reddish or pink roots, plant in March and April, and both horse and hand; the curl appears among them, but sometimes they "run wild," or tend to that state, producing more flowers than usual, and continuing flowering much later, sometimes till Michaelmas, and producing few tubers and slender stems. Whenever this is observed, the tubers of such potatoes are no longer used for propagation.

8. Grass.
Not much old surface, which there is chiefly upland.

9. Woods and Plantations.
Scampton elm, from a place of that name in Yorkshire, but supposed originally from America, will make shoots from grafts, in one year, of 5 or 6 feet: introduced in young plantations by Messrs. Falls, emulated nursery men, of Gateshead; vale of Derwent well wooded; Sir J. Eden a great planter.

10. Embankments.
Began on the Tyne in 1740, and about 1500 acres secured between that period and 1800.

11. Live Stock.
Short horned cattle. The famous Durham ox, bred by Charles Culling of Kellan in 1796.
Sheep. Teeswater and Leicester breed; stock bred, reared and fed in the most scientific manner, especially by the larger farmers mentioned above (4).

12. Political Economy.
Turnpike roads first made in 1744; materials, whinstone, limestone, river gravel, and freestone. Roads excellent where materials sufficiently small: they are also in good repair. Milestones on some roads, hollow triangular prisms of cast-iron, with projecting letters and figures. They are two and a half feet high, and fixed on an oak post, four and a half feet long, sunk two and a half feet in the earth. Guide posts much wanting. No iron railways, and no public roads or canals.

Manufactures. Wrought iron foundries, glass-houses, potteries, salt, copperas, sal ammoniac, coal tar, paper, woolen, cotton, and linen cloth. Several agricultural societies; the first established at Darlington in 1783.

chalders. Calculated that the whole coal of the counties of Newcastle and Durham will be exhausted in 550 years. Limestone, stone-marl, clay-marl, and sandstone, of great quantities; freestone, whinstone, and iron are all worked.

Water. The Tyne and Tweed have been long celebrated for their salmon fisheries: in the latter a rent of 800*l.* a year is paid for a fishing of two hundred yards in length, near the mouth of the river; and the same rent is paid for each of two other fishings above the bridge, not more than two hundred and fifty yards in length each. The fish taken here, are the salmon, bull-trout, whiting, and large common trout, and nearly the whole of them sent to London; in the conveyance of which, a great improvement has taken place of late years, by packing them in ponded ice; by this means they are presented nearly as fresh at the London market, as when taken out of the river. For the purpose of carrying them, and keeping up a constant and regular supply, vessels called smacks, sail three times a week, being purposely constructed for swift sailing, frequently make their run in forty-eight hours. These vessels are from 70 to 120 tons burthen; on an average twelve men are employed in each vessel, and make about fourteen voyages in a year; and not less than 75 boats and 500 fishermen are employed in taking the fish in the River Tweed.

2. Property.
One estate upwards of 40,000 acres, the rest vary from 20 to 20,000; small estates rare in the northern part of the county. Few counties in which estates have been so rapidly improved; several instances of the value trebled in forty years; principal causes letting large farms on twenty-one years

leases. Usual mode of letting farms, is to fix a rent six or twelve months before the expiration of the lease; but upon one of the largest estates in the county (the Earl of Tankerville's), the tenants have an offer of their farms (two years and a half or three years before the expiration of the lease, which is a mutual benefit to both landlord and tenant, and is attended with so many advantages, that it is in a fair way of being generally adopted.

3. Buildings.

Farmhouses formerly very shabby and ill contrived, now totally different. The most approved form of distributing the various offices is, on the east, west, and north sides of a rectangular parallelogram, (Fig. 797.) which is generally divided into two fold-yards for cattle of different ages, the south being left open to admit the sun; and for the same reason, and also for the sake of cleanliness and health, the farm-house (a) is removed in front thirty or forty yards; between which and the south wall of the fold is a small court for coals and young poultry; the barn (b) is 18 feet by 50, with threshing machine driven by horses, water, wind, or steam; on each side are sheds (c c), over which are granaries; beyond these, as wings to the main square, are sheds (d d), upon which are built corn stacks. One of these sheds is for wintering yearling calves, the other for holding implements of the larger kind. On the east of the main square is the stable (e), and in the west a house for cows and fattening oxen (f), each 16 feet by 48 feet. Over the pig sties (g), are poultry houses, which open into the court-yard of the house, as the pigsties do into the fold-yards for wintering young cattle. (A A.)

Cottages of stone and lime and tiled; floor of lime and sand; the living room fifteen feet by sixteen, and the cow-house nine feet by sixteen.

4. Occupation.

Farms generally large in the north, some from 2000. to 40000. a-year; in various parts farms from 500. to 1000., and from 1000. to 10000. or 15000. a year. The capital necessary for such farms, entitles the farmer to a good education, and gives them a spirit of independence and enterprise, that is rarely found amongst the occupiers of small farms and short leases. Their minds being open to conviction, they are ready to try new experiments, and adopt every beneficial improvement that can be learnt in other districts; for this purpose, many of them have traversed the most distant parts of the kingdom to obtain agricultural knowledge, and have translated every practice they thought superior to those they were acquainted with, or that could be advantageously pursued in their own situation; and scarcely a year passes without some of them making extensive agricultural tours, for the sole purpose of examining the modes of culture, of purchasing or hiring the most improved breeds of stock, and seeing the operations of new invented and more useful implements.

5. Implements.

Of the most approved kind; and some of these, as the plough, drill, horse hoe, &c. owe their chief merits to the improvements of Bailey. A pair of these machines is considered as preferable to the ones in common use for cutting hedges. They consist of a strong sharp knife, six inches long, moving between two square edged cheeks; the upper handle is two feet six inches long, and the other two feet three inches. (See *Encyclopedia of Gardening*, 1334. Fig. 122.)

6. Enclosures.

Size of fields varies with the size of the farms; in some parts from two to six or eight acres; in the northern parts, where the farms are large, from 50 to 100 acres. The quicks should never be planted nearer each other than nine inches, and, upon good land, a foot. Quicks four or five years old, with strong clean stems, are always to be preferred to those that are younger and smaller. It is a custom in some parts to clip young quicks every year; this makes the fence look neat and snug, but it checks their growth, and keeps them always weak in the stem, and, when they grow old, open at bottom; while those that are left to nature, get strong stems and side branches, which, by interweaving one with another, make a thick and impenetrable hedge, and if cut at proper intervals (of nine or ten years), will always maintain its superiority over those that have been clipped from their first planting. In point of profit, and of labor saved, there is no comparison; and for beauty, we prefer nature, and think a luxuriant hawthorn, in full bloom, or laden with its ripened fruit, is a more pleasing, enlivening, and gratifying object, than the stiff, formal same-ness produced by the shearer.

7. Arable Land.

Three ploughing practised by a few in breaking up grass-lands. About 1793, when horses were scarce and dear, a good many oxen were used for ploughing and carting about the farms; but after a few years trial, they were given up; they were harnessed both with yokes and collars, and only ploughed half a day at a time.

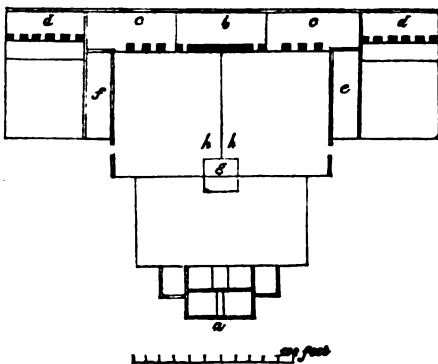
Fallow on all soils once in three or four years, was general through the county, till the introduction of turnips. On soils improper for this root, the naked fallow still prevails; but the quantity of fallow probably on all soils will, after a long course of good culture, become less necessary, and may in many cases be finally dispensed with.

Turnips were first grown in the northern parts of the county about 1723. Proctor, the proprietor of Roch, brought Andrew Willey, a gardener, to cultivate turnips at Roch, for the purpose of feeding cattle; that Willey afterwards settled at Leasbury, as a gardener, and was employed for many years to sow turnips for all the neighboring estates; and his business this way was so great, he was obliged to ride and sow, that he might dispatch the greater quantity.

Hoing turnips was introduced at the same time, and at first practised by gardeners, and other men, at extravagant wages. Education, about thirty years since, had the merit of first reducing the price of hoing, by teaching boys, girls, and women to perform the work equally as well, if not better than men. The mode he took was simple and ingenious; by a light plough,

without a mould-board, he divided the field into small squares of equal magnitude, and directed the boys and girls to leave a certain number of plants in each square. In a short time they became accurate, regular, and expert hoers; and, in a few years, all the turnips in the county were hoed by women and boys, at half the expense, and better than by men.

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The broadcast culture of turnips, in the northern parts of the county, was not inferior to any we ever saw; and in respect to accurate, regular, clean hoing, superior to what we ever observed in Norfolk, Suffolk, or other turnip districts which we have frequently examined. (Bailey.)

Drilling turnips was first introduced to the county about 1780. Drilling this, as well as other crops, evidently originated with Tull, whose first work, *Specimen of a new method of Horse-hoeing Husbandry*, appeared in 1731. It appears that Craig, of Arbigland, in Dumfriesshire, began to drill turnips about 1745; and next we find Philip Howard, of Corby, drilling in 1755; and Pringle drilling "from hints taken from Tull's book," in 1756 or 1757. William Dawson, who was well acquainted with the turnip culture in England, having been sent to reside in those districts for six or seven years, where the best cultivation was pursued, with an intention, not only of seeing but of making himself master of the manual operations, and of every minutiae in the practice, was convinced of the superiority of Pringle's mode over every other he had seen, either in Norfolk or elsewhere; and in 1762, when he entered to Froemore farm, near Kello, in Roxburghshire, he immediately adopted the practice upon a large scale, to the amount of 100 acres yearly. Though none of Pringle's neighbors followed the example, yet, no sooner did Dawson, an actual or rent-paying farmer, adopt the same system, than it was immediately followed, not only by several farmers in his vicinity, but those very farmers who had adopted Pringle's, whose crops they had seen, for ten or twelve years, so much superior to their own: the practice in a few years became general.

8. Grass.

Not much old grass in the county.

9. Woods.

Not very numerous, though a considerable demand for small wood by the proprietors of the collieries and lead-mines. Artificial plantations rising in every part of the county.

10. Improvements.

Embanking and irrigation practised in a few places which require or admit of these operations.

11. Live Stock.

Cattle the short horned, long horned, Devonshire, and wild cattle.

Sheep, the Cheviot, heath, and long woolled. The modern maxims of breeding were introduced into the county by one of Bakewell's first disciples, Cully, of South Durham, well known for his work on Live Stock, previous to which, "big bones" and "large size" were looked upon as the principal criterion of excellence, and a sacred adherence to the rule of never breeding within the canonical degree of relationship; but those prejudices are at this period, in a great measure done away; and the principal farmers of this district may now be classed amongst the most scientific breeders in the kingdom, who have pursued it with an ardor and unremitting attention that have not failed of success.

Horses for draught brought from Clydesdale. Goats are kept in small numbers on many parts of the Cheviot hills, not so much as an object of profit, but the shepherd fears, that the sheep flocks are healthier where a few goats do pasture. This probably may be the case, as it is well known that goats eat some plants with impunity, that are deadly poisons to other kinds of domestic animals. The chief produce of these goats is, from their milk being sold to invalids, who come to Wooler in the summer season.

12. Political Economy.

Roads of whin or limestone, and mostly good. Manufactures, gloves at Hexham, plait straw for cottagers and laborers' hats, and also for those of the higher classes. Woollens in a few places; and a variety of works connected with the coal trade and mines at Newcastle. No agricultural societies, these Bailey holds in little estimation; but thinks if public houses were established in each county, and supported by a rate on the income of its proprietors, they would be the most effectual means of promoting agricultural improvement.

7025. CUMBERLAND. 970,940 acres of mountainous district, remarkable for its picturesque beauty, and also of late greatly improved in its agriculture. The exertions of the late Bishop of Llandaff in planting, and of J. C. Curwen, Esq. in field culture, have contributed much to the improvement of this county, which, as far as its soil and climate permit, may be considered as on a par with Northumberland. (*General View*, by J. Bailey, and G. Colley, 1804. *Marshal's Review*, 1808. *Smith's Geological Map*, 1824.)

1. Introductory Observations.

Pringle informs us that "trees and plants, being altogether passive, accommodate themselves very slowly to a change of climate; but the idea has been already thrown out, that even those of the torrid zone may be made to flourish in the northern regions; may be even gradually inured to the climate; that the climate itself may be changed for the better; and that some thousands of years hence, reposing under their own olive trees, future Britons may quaff their own wine, or sip their own tea, sweetened with the juice of their own sugar-cane."

Pringle "found it impossible" not to mention to the Board that he was remarkably well treated when he surveyed the county, which "filled him with peculiar feelings of pleasure and respect." Some of those feelings he vents on Sir John Sinclair, in the following terms, "What gratitude is due to him (i) who first called the attention of the nation to its most important interests, and whose unremitting efforts are directed to promote the good of his country! How well does he deserve, and what a sure road has he chosen to immortal fame, that will survive the ravages of time, and smile at the fleeting celebrity of martial achievements!" "Thus," Marshal "observes, most assuredly *not him, but me.*"

In some *preliminary observations* to this report by the Bishop of Llandaff, are suggestions for settling poor people in cottages on the wastes, as has been done in Spain, and on the advantages which would result from planting them, especially with the larch and oak.

2. Geographical State and Circumstances.

Climate. Healthy, though subject to great and frequent falls of rain, especially in autumn, which renders harvest late and precarious: snow on the mountains for six or eight months. A average rain at Keswick seventy inches.

Soil. Clays and loams on the better parts of the valleys and hill sides, and peat earth on the mountainous districts.

Surface. Beautifully and greatly diversified, chiefly mountainous, and incapable of being improved by the plough; but part of the valley and plains are cultivable soils.

Minerals. Chiefly coal, lime, and lead ore; there are also black lead, copper, gypsum, lapis calamarinus, and excellent slate and freestone.

7026. WESTMORELAND. 450,722 acres, chiefly of mountain and moor, but with some few tracts of vale lands, cultivated or capable of cultivation. On the whole it is naturally the most unfavorable county to agriculture or comfortable living in England, owing to its wet and cold climate, ungrateful soil and rugged surface. (*Pringle's General View*, 1794. *Marshal's Rev.* 1808. *Smith's Geological Map*, 1824.)

1. Geographical State and Circumstances.

Climate. N.W. winds and rains prevail for eight months in the year: in 1792 eighty-three inches, medium forty-five or fifty inches, which is twenty inches above the medium quantity that falls in Europe. Air pure and healthy; winters long and severe. In 1791-2 thirty-six pounds were paid for cutting in the snow ten miles of horse track between Baid and Kendal.

The soil most prevalent on the low lands is a dry gravelly mould, and peat on the mountains.

Surface. Mountainous and hilly, and in most places incapable of cultivation by the plough.

Minerals. Some trifling veins of lead; limestone in abundance in most parts of the county; excellent blue slate; gypsum used for laying floors; freestone; and marble near Kendal.

Water. Several rivers and some lakes, corresponding in beauty and products with those of Cumberland.

2. Property.

As in Cumberland; land-owners called *statemen*, (for *statemen*) as in Ireland.

7027. LANCASHIRE. 1,150,000 acres, included in a very irregular outline, extending above a degree, or about seventy-four miles from north to south, containing mountainous and moory surface, and a large portion of low, flat, or moderately varied lands, of good quality. The soil in great part sandy, and chiefly in pasture. The early introduction and successful culture of the potatoe, distinguishes this county, and also the immense extent of its cotton manufactures, and very considerable foreign commerce from Liverpool. It is also the country of Brindley, the engineer. (*Holt's General View*, 1735. *Dickson's General View*, prepared by Stevenson, 1815. *Marshal's Review*, 1808.)

1. Geographical State and Circumstances.

Climate. Air every where pure and salubrious, but on the elevated parts cold and sharp; protected, however, by the northern and eastern ranges of mountains from the N. and E. winds; not much snow or long continued severe frosts. In 1819-20, when the thermometer in gardens near London had fallen ten degrees below Zero, that in the botanic garden at Liverpool never fell to Zero. Average of rain in the county, probably about thirty-two inches; in 1792, sixty-five; and in some years fifty. From a register of the times during a series of years, at which potatoes, asparagus, and gooseberries were first brought to the Liverpool market, it appears that the difference between an early and late spring is not less than six weeks.

Soil. On the mountains and moors rocky and peaty; on the northern part of the lowlands moist, cold, and rashly silt; on the rest chiefly sandy and loam.

Minerals. Principally coal, copper, lead, and iron; the first and last very abundant; there is also slate, grey-slate, and flagstones, freestone, and limestone.

Water. Seventy-five miles and upwards of sea-coast, and several rivers and meres.

2. Property.

Very variously divided; a considerable number of yeomanry from 10*l.* to 700*l.* per annum; a general spirit for possessing land and agricultural improvement; tenure, as usual, chiefly freehold.

Water. Sixty-seven miles of sea-coast, several large and small rivers, and the lakes well known for their beauty, and the excellent char, trout, and other fish which some of them produce.

3. Property.

Few counties where land is in such small parcels, and these occupied by their owners. The annual value of these tenements vary from 5*l.* to 50*l.* a year; generally from 15*l.* to 30*l.*, some few 100*l.* Largest estate in the county 13,000*l.* a year. Tenure of by far the greater part of the county "customary tenure," a species of vassalage, by which the holder is subject to fines, heriots, and various services to the lords of manors. A good deal has been enfranchised. Copyhold and leasehold are rarely met with; what is not customary is freehold.

4. Buildings, Implements, Arable Land, &c.

Approaching to that of Northumberland. A great many young plantations rising on the sides of the mountains.

5. Live Stock.

Cattle of various kinds; breed of the county a small long horned kind; but the most improved varieties are now introduced.

Sheep bred in the county the Herdwicks, a hardy mountain sheep. Some horses bred by the farmer, and bees very common. In every parish the taking of moor is let at a certain sum, and defrayed by a parochial rate per acre; a plan which will soon eradicate this animal from the county.

6. Improvements.

Various kinds, as draining, watering, planting, &c. made by Watson, Bishop of Llandaff, at Colgarth Park. Those of J. C. Curwen, Esq., of Workington, especially in feeding and fattening stock, have made a distinguished figure in the agricultural world since the publication of this report. Curwen, in fact, may be considered as the father of the soiling and steamed food feeding in England. In spite of a most ungrateful soil, and cold rainy climate, he manages to keep an extensive farm in the very best order, and what is rare amongst gentlemen who are cultivators, to cultivate with profit. He is a warm friend to agricultural merit in every shape, and one of the best hearted of men.

3. Buildings.

Very indifferent; few mere cottages; the laborer and mechanic generally reside in a small farm-house, and occupy more or less land.

4. Occupation.

Farms small, and farmers, who are generally proprietors, "live poorly and labor hard," in the fields in summer, and weaving in winter; wear cloths, the upper part of leather, and the soles of birch, alder, or sycamore. The culture of arable land is very limited, and, like that of greenland, was in a very backward state at the time the reporter wrote, but gradually improving. Dairying in a small way is generally practiced, but little attention to the sort of cow or breeding. The Earl of Lonsdale and Bishop of Llandaff have set the example as to planting.

5. Manufactures.

Woolen cloth or Kendal coatings, stockings, silk, gunpowder, &c. A private carpet manufactory at Lowther, by the Earl of Lonsdale.

3. Buildings.

Old farmeries the work of chance and random; houses often there, formerly occupied by proprietors, and offices without order or design, but various new erections on the most approved plan; cottages in many places comfortable, with good gardens, especially those occupied by operative manufacturers and mechanics. Those in the less improved parts of walled studd work, plastered or wrought in with tempered clay and straw; provincially "cat and clay."

4. Occupation.

Farms in general small; education and knowledge of most of the small occupiers very circumscribed; larger farmers more enlightened, and having more command of capital, are improving the culture of their farms.

5. Implements.

Little improvement, but the Northumberland plough and Melk's threshing machine introduced; horse patterns are almost peculiar to this county, and are used in cultivating light peaty soils.

1. Arable Land.

Less prevalent than grass; but great attention paid to the culture of potatoes, both by farmers and cottagers; the former generally cultivate in drills, and horse hood; the latter in beds or dibbled in rows, and hand hood. The method of growing early potatoes, and several crops on the same soil in one season has already been given. (4851.) Onions are cultivated exten

sively near Warrington, and rhubarb and madder have been tried, and grown to very great perfection, but not so easily dried and prepared for sale, as to induce a continuance of the practice.

7. Grass Lands.

Extensive, but chiefly coarse upland pastures: some good meadows and productive marsh lands. Application chiefly the dairy for home consumption of milk and butter; not much cheese made, excepting on the Cheshire side of the county.

8. Gardens and Orchards.

Excellent market gardens near most of the large towns. Liverpool remarkably well supplied: great quantities of cabbages and onions used by the shipping, and of dried herbs and onions exported; the dried herbs sent to Africa. "There is a certain farm in Kirkby, about eight miles north-east from Liverpool, the soil of a small part of which is a black loamy sand, and which produces great quantities of early and strong asparagus, and another farm, a part of which is of the same nature at a place called Orrel, about four miles north-west of Liverpool: both which produce this plant with less attention and less dung than requisite in the rich vale of Kirkdale, about two miles from Liverpool, where the greatest quantity of land in any place of this neighborhood is appropriated solely to horticulture."

Gardens of Mechanics. "A small patch of ground appended to his cottage, furnishes the weaver, smith, or carpenter with health and pleasure, and contributes to his sobriety; intemperance not unfrequently proceeding from want of recreation to fill up a vacant hour. This small space is devoted to nurturing his young seedlings, trimming his more matured plants, contemplating new varieties, in expectation of honors through the medium of promised premiums. Thus, starting at intervals from his more toilsome labors, the mechanic finds his stagnating fluids put in motion, and his mind refreshed with the fragrant breeze, whilst he has been thus raising new flowers of the auricle, carnation, polyanthus, or pink, of the most approved qualities in their several kinds; and which, after being raised here, have been dispersed over the whole kingdom. But not only flowers, but fruit, have been objects of their attention. The best gooseberries now under cultivation had their origin in the county of Lancaster; and, to promote this spirit, meetings are annually appointed at different places, at which are public exhibitions of different kinds of flowers and fruits, and premiums adjudged. These meetings are encouraged by master tradesmen and gentlemen of the county as tending to promote a spirit which may eventually be diverted into a more important channel. Those little societies for promoting the improved culture of the gooseberry prevail most in the southern parts of the county. They have unquestionably had much influence in bringing the different sorts of this fruit, and the currant, as well as some other species, to the present state of improvement. The gooseberry both of the red and white kind, is now in most places grown to a very considerable size, in some situations as large as a pigeon's egg. This is chiefly effected by keeping the plants much cut in their branches, and having well rotted rich manure applied frequently about their roots, the best being kept perfectly clear about them. The annual publications, called *The Manchester Gooseberry-book*, and *The Manchester Flower-book*, contain the names of the principal societies, and of the prizes awarded each year, and a variety of other information." *Dickson*, p. 428.

7028. CHESHIRE. 635,000 acres of verdant surface, exclusive of upwards of 10,000 acres of naked sands in the estuary of the river Dee. It is one of the most productive grass land districts in the kingdom, the grass retaining its growth and verdure, in a great degree, during the whole year, owing to the moisture and mildness of the climate. The department of husbandry in which it excels is cheese making, and it is also noted for its salt works from brine springs and rock. (*Medley's General View*, 1794. *Holland's General View*, 1806. *Marshall's Review*, 1809.)

1. Geographical State and Circumstances.

Climate supposed the most rainy in the kingdom.

General surface an extended plane, apparently thickly covered with wood. Barren hills on the eastern margin of the county.

Soils chiefly clayey or sandy; clay prevails, but very generally the two earths blended together, producing clayey loam, and sandy loam.

Subsoil chiefly clay, or marl; but also rammel, forsbench, gravel, or red rock. Rammel is a composition of clay, sand, gravel, and oxide of iron; it is in strata of from eighteen to thirty inches, on white colored sand, or clay marl. Forsbench is iron ore or oxide, which crumbles to pieces when exposed to the air; but is hard and rocky when under the soil, and is more injurious to trees than rammel, as it cannot be penetrated by their roots.

Minerals. Fossil salt and coal both extensively worked. There is also copper, lead, and freestone, but very little limestone. Salt is made from brine springs, as at Drottwich (7007.), and from beds of fossil salt. The former have been worked from time immemorial, and the latter from about 1670. By the operation of blasting, and the mechanical instruments usually employed in mining, the rock is obtained in masses of considerable size, differing in form and purity. The purer rock is pounded and used without other preparation; but the less pure is dissolved and refined in the same manner as brine.

Water. Several rivers and meres; the former are very muddy after rains, and not remarkable for their fish; but the latter abound in pike, bream, perch, dace, and eels.

2. Property.

Few counties of equal extent with so many wealthy landowners. Fifty proprietors resident in the county, with estates of from three to 10,000*l.* a year, and as many from one to 3000*l.* "From the advantages which have been derived from trade, and from the effects of the increase of taxes, which have prevented a man living with the same degree of comfort on the same portion of land as formerly, many of the old owners have been induced to sell their estates, and new proprietors have spread themselves over the country, very different in their habits and prejudices. It may be doubtful whether the change on the whole has been disadvantageous. Land, when transferred, is generally improved by its new possessor. With a view, and often a more enlightened view, of its advantages and resources, he brings with him the means and the disposition to try experiments, and give to his new acquisition its greatest

use. An orchard of sixty-four acres on the banks of the Irwell, near Manchester, and some others in sheltered places near the principal towns; but the prevailing west winds do much against their increase.

3. Woods and Plantations.

A good deal of planting going forward in most parts of the county, but not much old timber or copse.

10. Improvements.

Of moss bogs and marshes there is great extent, and we have already noticed the principal modes of improving them. (4183.) A good deal of draining, paring and burning, and liming has been done, and also irrigation in several places. A good deal of low sod embankment along the northern part of the coast, especially at Roskell, by Hesket. It was proposed some years ago to embank Lancaster and Ulverston sands, by which nearly 40,000 acres of sandy soil would have been gained at an expense of 150,000*l.* or according to some much less; but owing to the difficulty of getting the small proprietors of fisheries, and other trifling interests to agree, the idea was dropped at the time, and not resumed. The proposed modes of procedure for this and other intended embankments, are given in the report. Boglands have been extensively cultivated by the celebrated Roscoe, of which some account has been already given. (4191.)

11. Live Stock.

Cattle, the Lancashire or long horned, made the basis of Bakewell's improvements; a good many short horned also reared, when the dairy is the object. Larger grass farms near the populous towns, furnish more of the smaller cow butter, and the remote farms cheese. 100 cows kept in Wakefield's dairy near Liverpool. Cheese made resembles that of Cheshire, and chiefly from the long horned, or native breed.

Sheep not very common in this district. Generally a sort of the strong team kind, stout compact saddle horses, and middling size and bone for the stage and mail coaches.

12. Political Economy.

Roads had in most places, owing to the want of good materials, and the moist climate. In the coal tracts about Manchester, Bolton, and Wigan, the roads are all paved, as it was thought no other would stand the heavy traffic on them. These paved roads are said to be the most expensive, and most disagreeable of any; but they have here no other kind of material that will stand heavy cartage.

An ingenious road-maker in the neighborhood of Warrington, has lately exploded the common convex form, and adopted that of one inclined plane; the inclination just sufficient to throw off occasional water. The road between Worsley and Chorley, was made in this form, but it was found not to answer, as though it threw off the water, high and loaded waggon wheels were exposed to much danger of being overturned.

Various canals and iron railways; those of the Earl of Bridgewater, the most celebrated; but others of recent date more extensive. Many different manufactures; cotton in its different branches the most important; also, woollen, flax, iron, and, in short, almost as great a variety as in Derbyshire. Several agricultural societies; that of Manchester established in 1767.

value. He feels the want of comforts and conveniences, which custom had rendered familiar to a former occupier; he builds, drains, and plants; and, by his spirit and example, stimulates all around him to increased exertions.

3. Buildings.

Many noble mansions, especially that of the Earl Grosvenor, at Eaton.

Farm buildings, on the large dairy farms, in the middle of the county, extensive and convenient; in other places the reverse; and crowded in villages; old buildings of mud wall, wattle work, and clay, and covered with thatch; new of brick and slate. An excellent set of buildings (Ag. 798.) has been erected at Bromfield, near Warrington, on the estate of Sir P. Warburton. "A gentle descent from the ground at the front of the house has afforded Beckett, the occupier of this farm, the opportunity of conveying from a pond (a) a small stream through the farm-yard, which he irrigates the fields below the buildings. The superior richness of vegetation in these meadows furnishes abundance of food, the advantage which Beckett derives from availing himself of this assistance."

Beginning with the dwelling-house of this farmery, it contains an entrance and passage (1), house place (2), servants' dining-room (3), back parlor (4), dairy, with wry press in its upper story (5), room for the cheese after it is taken out of the salt (6), milking-house and salting-room (7), stairs to cheese-room (8), parlor, with cellar under (9), pantry (10). The immediate appendages of the house chiefly connected with the dairy are ranged on three sides of the inner yard (11), and consist of a cow-house (12), wash-house, with pigeons-house over it (13), pump (14), pipe to boiling pans (15), boiler for pig-meat (16), privy (17), place for ashes (18), privy (19), inner pig-cot (20), outer pig-cot (21), passage (22), inner pig-cot (23), outer pig-cot (24), inner pig-cot (25), outer pig-cot (26), passage (27), inner pig-cot (28), outer pig-cot (29).

The farm-yard consists of a court, containing a large duck-pond and dunghill, surrounded by a broad passage, and enclosed on the west, east, and south sides by buildings, the north side being the wall of the inner yard. These buildings consist of a cow-house (30), double cow-house (31), double cow-house (32), fodder-bin (33), pig-house (34), corn-bag (35), threshing-floor (36), corn-bag (37), corn-bag (38), corn-bag (39), threshing-floor (40), corn-bag (41), cart-hovel, with granary above it (42), stable (43), stable, or calf-cot (44), calf-cot (45).

Cottages much the same as in other counties; improving with the age. All the intelligent persons whom Dr. Holland conversed with, have invariably found, that the attachment of a small portion of land to the cottage of the laborer has been the direct means of rendering his situation in life more comfortable and easy, and of inducing those habits of honest independ-

their habits, and, by consequence, in their ideas. Industry and excellent management of the dairy, women of this county much to be commended; less generally, for seven years.

5. Implements.

Rotherham plough and other good implements. A short strong scythe, with a blade twenty inches in length, and concave in the middle, is used for scooping out the crowns of rush stools.

6. Arable Lands.

In small proportion to the pastures. Cabbages a good deal cultivated for cattle. Carrots near Altringham for the Manchester market, and also used for the London seedmen. Onions also for the Lancashire markets. The soil about Altringham dry and loamy; the carrots large, coarse, and fit only for horses and cattle.

7. Grass.

Natural meadows numerous, rich, and fertile. They are situated on rivers, which, from the frequency of heavy rains, overflow and enrich them. Extent of upland pasture very considerable; that on a tolerably stiff clay soil, especially with a substratum of marl, is reckoned the best for the dairy; more milk may be had from cows pastured on a rich loamy soil, but it is esteemed inferior in point of quality. Many farmers complain that their land is too rich for the dairy, by which the adhesive properties of the cheese is diminished; feeding of cattle little practised.

8. Gardens and Orchards.

Good gardens to most of the farm-houses. "All the varieties of raspberries, currants, strawberries, and gooseberries, are to be met with in the farm and cottage gardens in Cheshire. The culture of the latter fruit has been particularly attended to of late years; and there are several meetings in different parts of the county, where small premiums are adjudged to those who produce, out of their own gardens, gooseberries of the greatest weight. The common fruit trees, such as the apple, pear, cherry, and plum, are likewise grown in almost every garden. Of the latter kind, the damascene plum is by much the most common; and is an article of considerable profit to the cottager.

Orchards not numerous, and rather on the decline.

9. Woods and Plantations.

Few of large extent, yet the quantity of timber very greatly exceeds what would be a fair average for the kingdom at large. In the northern and middle parts the number of trees in the hedgerows and coppices is so considerable, that, from some points of view, the whole county has the appearance of an extensive forest. The most considerable ancient woods, in the Earl of Stamford's park at Durham Massey. Few spots can boast such an assemblage of stately oaks, elms, and beeches. During a storm of wind, on the 21st of January, 1802, several hundred trees were torn up by the roots. One of these, when barked, contained 403 feet of timber, and was sold at six shillings and sixpence per foot, to the extent of 373½ feet. An elm blown down at the same time measured 146 feet. A colony of herons had for ages fixed their residence on the summits of these trees; but on one of them being torn up they retreated to a neighboring grove of beeches, where they have ever since enjoyed a secure abode.

A plantation of 1000 acres at Taxall, F. Jodrell, Esq.; it was planted by White, the landscape gardener, of Woodlands, Durham, at five pounds per acre, half the trees to be firs. Extensive plantations by Ashton, on Delamare forest.

Whitely, an ingenious tanner, at Ashley, near Knutsford, made some experiments a few years ago with the twigs and ends of the boughs of oak, as a substitute for the bark. These ground down, and used in the same way as the bark, manifested strongly astringent properties; but the necessity there was found to be for their immediate application, took away very greatly from their value; and their use is now almost entirely discontinued, though the plan at that time was adopted by several other tanners.

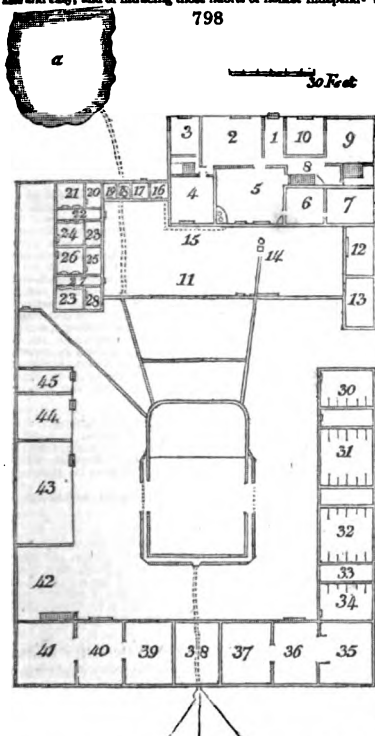
10. Improvements.

Draining a good deal practised, especially with bricks and stones. Faring and burning, marling, sanding, claying, and liming, also practised to different degrees of extent. Sand of advantage chiefly by altering the texture of the soil, as that used contains no calcareous matter.

11. Live Stock.

Present stock of dairy cows a mixture of the long and short horned, the Derbyshire, Shropshire, Staffordshire, Welsh, Irish, Scotch, and New Leicestershire cattle. Those cows reckoned best which are bred on the farm. Calves reared from the best milkers, and at two years old put to the cows. Cows housed about the middle of November; permitted to go dry ten weeks before their time of calving: usual dry foods, wheat, barley, and oat straw, hay, and crushed oats. The two former kinds of straw are found to make cows go dry much sooner than the latter; and another generally allowed effect attributed to such straw is, that more than usual time may be butted to churn the cream of cows when so fed; but wheat required to change the cream of cows when so fed; but wheat straw is esteemed much more wholesome than barley straw, as having less of those effects attending it. Three or four weeks before calving, hay given; and from calving to turning to grass, some ground or crushed oats twice a day. The cows are about ten o'clock in the morning, and housed again about four in the afternoon the winter through, or earlier if they shewed an inclination to return; but have no fodder in the outlet. Turning the cows out to grass in good condition is a matter much attended to, in order that they may, as the term is, "start well;" for if a cow is not in good condition when turned out to grass, or has been too much cried with barley straw, it is a long time before she gets into full milk.

The ox-cabbage and Swedish turnip are the kinds of green food most esteemed and cultivated in Cheshire. The former is usually given to the cows when the after-grass is consumed; it is sometimes given in the spring to cows that have newly calved. The large sugar-loaf cabbage has been occasionally used, when the pastures begin to fail and the after-grass is not ready; a circumstance which frequently happens, especially in dry weather. Turnips are given to the cattle in the winter, while they are feeding on straw; and as, at this time, the cheese is made, any objection to their use, from the flavor they give to the milk, is of little consequence. The reporter made inquiries from several farmers, with a view of ascertain-



ance, of temperance, and of industry, which are most efficacious in promoting the happiness of individuals, and, consequently, the general interests of society.

Lord Penrhyn's poultry-house, at Warrington, are supposed the most magnificent that have ever been built. They are united in a building which consists of a handsome regular front, extending about 140 feet; at each extremity is a neat pavilion, with a large arched window. These pavilions are united to the centre of the design by a colonnade of small cast-iron pillars, painted white, which support a cornice, and a slate roof, covering a paved walk and a variety of different conveniences for the poultry, for keeping eggs, corn, &c. The doors into these are all of lattice work, also painted white, and the framing green. In the middle of the front are four handsome stone columns, and four pilasters, supporting likewise a cornice and a slate roof, under which and between the columns is a beautiful mosaic iron gate; on one side of this gate is an elegant little parlor, beautifully papered and furnished; and at the other end of the colonnade a very neat kitchen, so excessively clean, and in such high order, that it is delightful to view it. This front is the diameter or chord of a large semicircular court behind, round which there is also a colonnade, and a great variety of conveniences for the poultry: this court is neatly paved, and has a circular pond and pump in the middle of it. The whole fronts towards a rich little field or paddock, called the poultry paddock, in which the poultry have liberty to walk about between meals. It happened while the reporter was there to be their dinner time, at one o'clock. At this hour a bell rings, and the beautiful gate in the centre is opened. The poultry being then mostly walking in the paddock, and knowing by the sound of the bell that their repast is ready for them, fly and run from all corners, and rush in at the gate, every one striving who can get the first share in the scramble. At that time there were about 600 poultry of different kinds, in the place, and although so large a number, the semicircular court is kept so very neat and clean, that not a speck of dung is to be seen. This poultry place is built of brick, excepting the pillars and cornices, and the lintels and jambs of the doors, and the windows, but the bricks are not seen, being all covered with a remarkably fine kind of slate from his lordship's estate in Wales. These slates are closely jointed and fastened with screw nails, on small spars fixed to the brick; they are afterwards painted, and fine white sand thrown on while the paint is wet, which gives the whole an appearance of the most beautiful freestone.

4. Occupation.

Farms very small; a great many under ten acres; only one or two at 350 or 400 acres; excluding all those under ten acres, the average of the county may be seventy acres. Large and small farmers completely different characters;—different in

ing whether the stall feeding of their milch cows might not be continued during the whole year, but he found the general opinion to be against this practice; though it did not appear that any experiments, sufficient for the decision of the point, had hitherto been made. It was suggested to him, however, that it would be an improvement upon the present management, to let the cows stand in their houses during the heat of the day in summer; where, by giving them a few cabbages or tares, the milk would continue forming, and the cattle be defended from the gad-flies, which, by tormenting them in the fields, frequently injure both the quantity and quality of the milk.

Time of milking March and April. At calving-time the cowman, or the master, are frequently two or three times in the course of a night, to see whether any thing is amiss. The racks and mangers are every day well cleaned out, while due attention is paid to the appetites of the different beasts, and the quantity of food is governed accordingly. After this is done, the master himself, generally, goes round from stall to stall just before bed-time, and adds to or diminishes the quantity of fodder as occasion may require.

In making butter the whole of the milk and cream is churned together. Cheese made from the whey pressed from the curd used in making cheese.

Cheese-making has remained stationary in Cheshire for many years; best size of cheeses sixty pounds. Cows milked during summer at six o'clock, morning and evening. "The evening's milk (of suppose twenty cows) having stood all the night in the coolers and brass pans, the cheese-maker, in summer, about six o'clock in the morning, carefully skims off the cream from the whole of it, observing first to take off all the froth and bubbles, which may amount to about a pint: this not being thought proper to be put into the cheese, goes to the cream mug to be churned for butter, and the rest of the cream is put into a brass pan. While the dairy-woman is thus employed, the servants are milking the cows, having previously lighted a fire under the furnace, which is half full of water. As soon as the night's milk is skimmed, it is all carried into the cheese tub, except about three-fourths of a brass pan full (three or four gallons), which is immediately placed in the furnace of hot water in the pan, under scalding heat; the half of the milk thus heated in the pan is poured also into the cheese tub, and the other half is poured to the cream, which, as before observed, was skimmed into another brass pan. By this means all the cream is liquified and dissolved, so as apparently to form one homogeneous or uniform fluid; and in that state it is poured into the cheese tub. But before this is done, several bowls or vessels, full of new milk, will generally have been poured into the cheese tub, or perhaps the whole morning's milk. Care is taken to skim off all the air bubbles which may have formed, in pouring the new milk into the cheese tub. The night and morning's milk, and melted cream, being thus all put into the cheese tub, it is then ready to receive the rennet and coloring, or, in the terms of the art, to be set together. The rennet and coloring being put into the tub, the whole is well stirred together, a wooden cover is put over the tub, and over that is thrown a linen cloth. The usual time of coming is

one hour and a half, during which time it is frequently to be examined: if the cream rises to the surface before the curd has taken place, as it often does, the whole must be stirred together so as to mix again the milk and cream, and this as often as it rises, until the coagulation commences. A few smart strokes on different sides of the tub, with the cheese ladder, &c. will forward the coagulation, if it is found to be too long in forming.

The curd is in the next place broke by the knife and hands, and then left half an hour to subside; then it is gently pressed, the curd broken by the hand, and the whey laid out of the tub, as it drains from the curd. Afterwards, the curd is broken in a brass pan and salted, and next put into the cheese vat, and pressed with a sixty pound weight, till all the whey is removed. It is then again broke, washed with warm whey, and finally put in the press under a weight or power of about 14 cwt. After being forty-eight hours in the press, it is put in the salting tub, where it remains three days covered with salt; it is then taken out and placed on the salting benches, where it is turned once a day; it is then washed in warm water with a brush, and wiped dry with a cloth; in two hours it is smeared over with whey butter, and then put in the warmest part of the cheese room. In the cheese room it is well rubbed, to take off the sweat or fermentation which takes place in cheese for a certain time after it is made, and turned daily for seven days, and unsmeared with whey butter; afterwards it is turned daily, and rubbed three times a week in summer, and twice in winter.

The cheese vases are commonly placed over the cow-houses; and this is done with a view to obtain that moderate and necessary degree of temperature so essential to the ripening of cheese, to which the heat arising from the cattle underneath, is supposed very much to contribute. (In dairy farms, one woman servant is kept every ten cows; three women are employed in winter in milking, spinning, and other house-wifery business; but in milking, the women, both night and morning, during summer, where large dairies are kept, are assisted by all the other servants, men and boys, except the man who drives the team.)

Sheep little attended to in Cheshire.

Horses brought from Derbyshire and Leicestershire.

Hops, a mixture of long and short eared breeds.

Poultry of the common kind abundant in most farms for their eggs. Geese kept by the cottagers till midsummer or later, and then sold to the farmers, who fatten them on their tables.

Bees to be found at many of the farm-houses, and at some of the cottages.

12. Political Economy.

Raw wool; various kinds, an extensive commerce of wool and salt, and manufacture of silk, woollen, linen, and cotton. An experimental farm established at Waverham, near Northwich, by some gentlemen and farmers of the neighbourhood, but it was soon found so expensive and losing a concern as to be abandoned. Those on the plan suggested by Bailey, (1794,) seem the most likely to be effective and permanent.

7029. HAMPSHIRE. A maritime county, which includes also the Isle of Wight: the latter contains 94,000 acres, and the continental part of the county, 968,150 acres. The climate of this country being remarkably mild, and the soil in many places being calcareous, and consequently warm, very early arable crops are produced in some places, and pease grown better than in many districts. The culture of the county, however, has little to recommend it, either in its tillage or pasturage. Its woods are extensive. (*A. and W. Drier's General View*, 1794. *Vancouver's General View*, 1806. *Warner's Isle of Wight*, 1794. *Marsden's Review*, 1817.)

1. Geographical State and Circumstances.

Climate generally mild.

Soil in the central parts, a strong flinty calcareous loam; in other parts generally gravelly, or sandy, and calcareous. The soil of the Isle of Wight is partly a clayey and calcareous loam, and in part lighter.

Minerals: none of any consequence; potters' clay, sand, and building-stone in different places.

Water scarce in dry seasons, in the chalk districts, where it is preserved in tanks, and drawn up from wells 500 or 400 feet deep. In some parishes after a long dry autumn, there has been more strong beer than water. A good deal of fishing, on the coast; of eels after floods in the smaller streams; and some fish ponds on Bagshot Heath.

2. Property.

Largest estates on the chalky districts; largest 8000l. per annum. Great bulk of the lands held and cultivated by yeomanry; tenures, copyhold, and leasehold, from the superior lords or freeholders.

3. Buildings.

Houses of proprietors numerous: farm-houses mostly of great antiquity; those of the larger kind were formerly grange or manor-houses; out-buildings numerous, and generally ruinous; cottages often of mud (green, or white, but better on the whole than in some other counties. Some fanciful rustic structures as shelters or temporary lodges for cattle, in the forest district. (*fig. 799.*)

4. Occupation.

Farms various, rather small.

5. Implements.

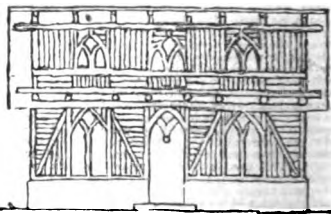
Hampshire plough, an extraordinarily bulky, clumsy structure: the Suffolk is used in the eastern parts of the county, and in the Isle of Wight. The patent Hampshire waggon is formed by joining two carts corresponding with the fore and hind parts of a waggon, by bolting them together. The thill of the hind cart passes under the bed, and rests on the pillow of the fore-cart. The union is simple, yet so complete, as to render this waggon as strong, if not stronger, than the common kind.

6. Arable Land.

Tillage difficult and expensive in the chalk district, light and easy in the vale of Avon. Pease a good deal cultivated on the chalks, especially the Marlborough grey or petrified; the charlton and pease in warm situations they are drilled and often sown before Christmas, or in January. "A considerable roversy still seems to hang over certain properties of these pease, with regard to their boiling well for soup or porridge; good

boilers being sometimes sown upon fields which have never been known to refuse yielding a produce possessing a similar quality, but that effect afterwards coming, and a hard indur-

799



soluble pease has been produced that continued for several successive periods; whilst on the other hand, land that had never been known, or even suspected of being able to communicate a boiling quality to its pease, would unexpectedly give to the produce of a hard, and almost impenetrable pea, all the properties of being excellent boilers. Through all the cedar-colored sand, and gravelly loams in Devonshire, good boilers are stated to be uniformly produced, and in continued succession. The same kind of soil, and in every respect under similar circumstances in the Isle of Wight, will only occasionally, and by accident as it were, produce good boiling pease. Some opinions seem to refer this effect to a peculiarity in the seasons; but this cannot stand against a well known truth, that good boilers are produced every season.

Hotbeds cultivated with success on the chalky soils, and very productive. Hops on the borders of Murray. A vineyard was planted at Undercliff, in the Isle of Wight, by the late Sir Richard Worsley, in 1792, and an Anjou vine-dresser brought over to attend it; the extent was about two and a half acres; white wine was made; but in 1806, when Mr. Vancouver called to see it, he found the vines had been grubbed up, and the ground changed to a lawn of turf.

7. Grass Lands.

The county famous for water meadows, which are well ma-

ingnd, and productive; they are chiefly in the neighborhood of Winchester, on the Itchen; but there are instances on most of the other rivers and streams.

8. Gardens and Orchards.

Excellent market gardens near Gosport and Portsmouth; Portsea Island noted for its brocoli; white-washed mud walls, with copings of hatched used as fences, and for wall fruit in some cases; and fruit walls only half a brick thick, and waving at the rate of one foot in twenty in the air. In other cases angular wares are in use, the angles being right angles, and the sides ten feet each. The advantage in both cases, is the saving of bricks; but it is evident they cannot be carried very high, nor, subject as they are to the driving and drawing of nails, can they be of great duration. (See *Encyclopædia of Gardening*, 1867.)

Orchards in various places, and cider made both in this county, and in the Isle of Wight.

9. Woods and Plantations.

Extensive beechwoods on the chalk district, those of Ditchen grove very fine; elm-woods in the county, but abundant in Strathfield Park (now the Duke of Wellington's). Oak abundant in the New Forest district, and many young plantations there, and throughout the county. Cobbett raised a great many American trees of various species at Bosley. There are several considerable forests, viz. the New Forest, Alice Holt, Woolmer, and Bere.

The New Forest is situated on the south side of Hampshire; it was formerly bounded on the east by Southampton river, and on the south by the British Channel, being near thirty miles in length, and ninety in circumference; but since the disafforestation by Henry the Third, and Edward the First, its boundaries are much reduced, and now only extend from (Ipsdhill, on the north west, to the sea, on the south-east about twenty miles; and from Hardley, on the east, to Kingwood, on the west, about fifteen miles; containing within those limits about 92,655 acres, the whole of which does not now belong to the crown, as several manors and freehold estates, to the amount of 24,791 acres, are private property; about 625 acres are copyhold, belonging to His Majesty's manor of Lyndhurst; 1004 acres are leasehold, held under the crown; 900 acres are freehold; 1193 acres are held by the master-keepers and groom-keepers attached to their respective lodges; and the remaining 65,844 acres, are the woods and waste lands of the forest. The other forests are of much less extent and interest.

10. Improvements.

Good examples of draining by tapping, were exhibited by the Earl of Cadogan, on Cadogan Park estate; the strata lying at a small angle with the horizon, enabled the principles of what is called Elkington's mode of draining, to be carried completely into effect. In the eastern part of the Isle of Wight, are various tracts of marshy ground, the largest of which, Brading Haven, containing about 900 acres, was granted by James I. to one Gibbs, a groom of the bed-chamber. The owners of the adjoining lands contested this grant, which the king was very earnest in supporting. After a verdict obtained in the Court of Exchequer against the gentlemen of the island, Gibbs sold his share for 5000*l.* to Sir Bois Thelwall, a page of the king's bed-

chamber, who admitted the famous Sir Hugh Middleton to a share. They employed a number of Dutchmen to enclose and recover the haven from the sea. The first taking of it cost 4000*l.* and 1000*l.* more was expended in building a dwelling-house, barn, water-mill, trenching, quicksetting, and other necessary works; so that, including the original purchase, the total expenditure amounted to 7000*l.* But after all, the value of the ground did not answer the expectations of the undertakers; for though that part of it adjoining Brading proved tolerably good, nearly one half of it was found to be a light running sand; nevertheless, an incontestible evidence appeared, by the discovery of a well, cased with stone, near the middle of the haven, that it had formerly been good ground. Sir Hugh Middleton tried a variety of experiments on the land which had been taken in, before he sold his share; sowing it with wheat, barley, oats, cabbage, and finally with rapeseed, which last was alone successful; but the greatest discouragement was, that the sea brought up so much ooze, weeds, and sand, which choked up the passage for the discharge of the fresh water. At length, in a wet season, when the inner part of the haven was full of fresh water, and a high spring tide, the waters met under the bank, and made a breach. This ended this expensive project; and though Sir John Oglander, who lived in the neighborhood, compares him to a friend to the undertaking, which, besides its principal object, tended to render that part of the country more healthy, he declares it as his opinion, that the scheme can never be resumed to any profitable purpose.

11. Live Stock.

No exclusive breed of cattle. The Somerset, Suffolk, Leicester, Hereford, Devon, &c. are indiscriminately met with. Several ox teams.

Sheep. In the Woodland district the heath sheep, old Hampshire, or Wiltshire breeds, but most of the improved breeds also to be met with.

The Hereford used in teams generally large, heavy, inactive animals. Small horses bred in vast numbers upon the heaths and forests, and which have not improperly acquired the name of heath coppers. Their ordinary height is about twelve hands. They propagate indiscriminately upon these wastes, where they are their living throughout the year, and in four years old may generally be purchased at about five pounds.

The native hog of this county is a coarse, raw boned, flat sided animal, agreeing in no respect with the idea entertained of it in other parts of the kingdom. The great number fed for a few weeks in the close of autumn, upon the acorns and mast which the forests and their woodlands produce, in the counties of Hereford and Gloucester, has been the cause of the introduction of a more excellent mode of curing hog-meat practised by the housekeepers, have contributed in a far greater degree to establish that superiority ascribed to Hampshire bacon, than any inherent excellence in its native breed of hogs. Very few, however, of the genuine native hog are to be met with, the common stock being either the native Berkshire breed, or a considerable predominance of that blood in the native swine of the county.

12. Political Economy.

Roads in general good, especially in the New Forest. Several canals, and various manufactures and public works at Portsmouth and other places.

7030. WILTSHIRE. 878,000 acres of varied surface, partly chalky downs, and partly rich vale land; and both a corn and grass county. It produces excellent cheese and butter, fat cattle, pigs, and store sheep. The agricultural report of this county was drawn up by T. Davis, steward to the Marquess of Bath, at Longient, a man of great experience as a land steward, surveyor, and farmer, and universally respected. He divides the county into two districts, the south-east, and north-west, a very judicious plan for giving correct agricultural information.

7031. South Wiltshire.

Wiltshire downs contain about 500,000 acres of hilly surface, mostly unenclosed and in common pasture; the acorn pasture cold and sharp, with a chalky soil, seldom varied by patches of loam, said to be the only place where there is a river or brook in this district that is not applied in some way or other to the purposes of irrigation.

1. Property.

Near large towns property is generally subdivided when sold in this district, when any is sold it is generally bought up by such as are considerable proprietors, hence estates generally large. Shape of the manors shows that many of them were the property of one lord; each borders on, or contains a rivulet for water and meadow, and a hill for wood, or where these were wanting, they were supplied by a grant of those articles from other property. Proprietors generally resident on their estates.

2. Buildings.

Farm-houses generally crowded together in villages, for convenience of water. Some of late years erected central to their farms, by the Earl of Pembroke and other proprietors; wells and ponds an important article in these erections.

3. Occupation.

Farms of two kinds; those in severalty or not subject to rights of common, are from 150*l.* to 500*l.*, and one or two at 1000*l.* a year; customary tenants, subject to rights of common, are from 25*l.* to 40*l.* or 60*l.* per annum. There are extensive sheep commons and cow commons, to which the occupiers of both descriptions of lands have a right to turn in stock according to certain fixed and customary regulations. Leases seven, fourteen, or twenty-one years.

4. Implements.

A heavy two wheel and one wheel plough in use; the latter sometimes with a foot instead of a wheel.

5. Arable Land.

An old error, that of over pulverizing the uplands by too frequent ploughings, by which the wheat were thrown out during winter, or if they stood the winter, the March winds blew away the earth from their roots, and "hanging by one leg," and thus not receiving any assistance from the corn root, they withered away in a few weeks, and produced small thin ears. Many modes have been introduced to prevent this evil, by giving a sufficient texture and firmness to the land previous to a wheat crop. The best farmers have made a point of getting their lands clean ploughed by midsummer, and treading it as firm as possible with the sheep-flocks in the time before sowing; while the slovenly farmers have invented, and generally pro-

tise, a very short and cheap way of attaining this firmness in the land. They rather the land (as they call it), that is, they plough half of the land, and turn the grass side of the ploughed and furrow on the land that is left unploughed. They do this as soon as they can spare the feed of the summer-field, and leave it in that state till near seed time, when they harrow it down and plough it for sowing. This raster is usually ploughed across the ridges, or what is better, diagonally; the latter mode being less subject to drive the land up in heaps before the plough. The land thus rastered is sometimes ploughed twice, but more frequently only once, previous to sowing; and after it is sown they drag it two, three, or four times, and harrow it four, five, or six times. A very heavy kind of drag is used, and as Wiltshire down farmers are very cautious of ploughing their land too much, they make much use of these drags instead of ploughing, and frequently let in their seed-wheat with them. This practice having been found to answer, has been gradually improved upon. The down lands of this district will not bear fallowing, especially in hot dry weather; they are too light already, and require rest. Two years' rest for wheat is equal to the best cost of dung. Dung may give the quantity, but rest must give the quality.

The course of crops was formerly fallow, wheat, barley, oats; but now, even on the common fields, is wheat, barley, clover, mowed one year, and fed two years, till it is necessary to plough for wheat, turnips, swedes, and grass. It is necessary to plough for sheep, though less necessary than in districts less amply provided with water meadows. Error that of sowing too much corn.

Gardens near Devizes, Levington, Wootton Bassett, Westbury, &c. Many families subsist by this kind of husbandry, occupying from two to five acres each as garden ground. The produce supplies the adjacent towns in the district, and Frome and Bath, in the county of Somerset, with cabbage-plants, pease, beans, carrots, turnips, and vast quantities of potatoes. Broads in some places, and cider made; but as the district is famous for its barley and ale, the predilection for this beverage renders the want of cider little felt.

Woods not numerous, but a great spirit for forming plantations; and some excellent remarks on the subject in the Report.

Produce introduced into this district at the end of the seventeenth, or the beginning of the eighteenth century. Many of the most valuable and best formed meadows, particularly those in the Wyley Moore, were made under the direction of one Farmer Baverstock, of Stockton, between the years 1700 and 1705.

Between 15,000 and 20,000 acres watered; its great value in April between "hay and grass," by which the farmer is en-

abled to breed early lambs." As soon as the lambs are able to travel with the ewes (perhaps about the middle of March), the flock is put into the water-meadows. Care is, or ought to be taken to make them as dry as possible for some days before the sheep begin to feed them; and on account of the quickness of the grass, it is not usual to allow the ewes and lambs to go into them with empty bellies, nor before the morning dew is gone. The general hours of feeding are from ten or eleven in the morning till four or five in the evening, when the sheep are driven to the fold, which at that time of the year is generally in the barley fallow. The grass is daily hurried out in portions, according to the number of sheep, to prevent their tramping it down; but a few spaces are left in the hurdles, for the lambs to get through, and feed forward in the rich grass. One acre of good grass will be sufficient for 500 couples for a day: the great object is, to make the water-grass last till the barley sowing is finished: the meadow is then laid up for hay.

The water-meadows of *Orchendon*, a village six miles N. W. of Amsbury, have been long celebrated. "What is called the long grass of these meadows is the *agrostis stolonifera* or black couch "one of the worst grasses," says Davis, "in its native state which the kingdom produces, and the peculiar plague of the farmers of that district." It usually abounds in such arable land as is too poor to grow the white couch (*Trifolium repens*), and is the general and almost only herbage of the old, burnt, worn-out downs, and in that situation is so coarse and wiry, that no cattle will eat it. It forms a thick tough covering over the lands which preserves itself, and destroys every thing else. But in these meadows, when fed abundantly with water, it is of a nourishing quality, and makes the most desirable hay in the district, particularly for sheep. These meadows are not laid out in any regular form for watering, the supply of water being too partial, but they depend entirely upon the floods; and being situated at a sharp turn of a narrow part of the river, the water makes an eddy, and deposits its sediments upon them.

The substratum of these meadows is an almost entire bed of loose flints, in which the roots of grass freely run, and produce strong succulent shoots, which fall down, and taking root at the joints, send forth other shoots, which, in like manner, drop and root again, so that the stalk is frequently eight or ten feet in length from the original root; and though the cup is exceedingly thick, it is, perhaps, not eighteen inches in height. But this grass, though very abundant in those two meadows, prevails in most of the meadows which lie below on the same stream; and whenever the winters are productive of floods, the grass in all of them is abundant in quantity and succulent in quality, and the hay is exceedingly nutritive; but in a year when water is scarce, their produce is extremely small, and of a very bad quality.

On examining other meadows in different bournes of this district, we find the same grass uniformly to abound in those situated near the spring-heads, and which in some years have plenty of water, and in others none at all. The same remark on its variation in quality and quantity, according to the wetness or dryness of the winter, is equally just. The most probable way of accounting for it, is, that it is almost the only grass common to water-meads at all, and will stand wet and dry, or though it nourishes most when under water, yet no dry weather will kill it.

Live Stock. Cattle few in this district; even not generally under the plough; sheep the chief stock and the basis of the Wiltshire husbandry; and horses, which find little employment, a consequence rather than a cause of keeping sheep. Horses a heavy very unsuitable breed; great error in principle of breeders here as every where among the old school, that of enlarging the size of the animal.

7032. North Wiltshire.

Climate milder than that of the S. E. district; soil not so uniform; under-stratum broken stones, and surface reddish calcareous loam.

Produce more divided than in the east side of the county.

Buildings. Chert, a noble pile, by Inigo Jones. Farms generally enclosed, and chiefly under grass, and applied to the making of cheese; leases from fourteen to twenty years.

Scottish farmers. "Within these few years, several of the great landholders in Wiltshire have introduced into this district Scottish farmers, who, from a supposed superior skill in the science of agriculture, have leases for twenty years, with scarcely any restrictions as to husbandry. The ancient pastures are allowed to be broken up, buildings are erected for their accommodation at a low rate of interest, and a degree of coun-

7033. DORSETSHIRE. 512,154 acres of undulating surface, in great part chalky soil, and celebrated from the time of the Romans for its pleasantness and fertility. Like Berkshire and some other counties, it is called by the inhabitants the garden of England. It is chiefly under grass, and is celebrated for its breed of sheep, which bring three lambs in two years, and for its watered meadows, of which Boswell, of this county, has given a valuable account. (*Claridge's General View*, 1793. *Stevenson's General View*, 1812. *Marshall's Review*, 1817.)

1. Geographical State and Circumstances.

Climate dry and salubrious rather than mild and humid; supposed colder since the elevated downs were denuded of their native forests.

Soil chiefly chalk, next clay, then sand, and of loam, gravel, &c. nearly equal and moderate portions. Chalky and sandy soils of the uplands very thin.

No metallic mines or coals, but the peninsula of Portland four miles and a half in length by two in breadth, one entire quarry of Portland stone, so extensively used, especially in London. Pottery clay found in various parts of the county.

2. Property.

Estates large compared with those of other counties; some of the principal under the care of land surveyors, others of lawyers. Tenures chiefly freehold and leasehold.

3. Buildings.

Farm buildings as in other counties; generally ill situated, built of stone, and covered with reeds or thatch.

4. Occupation.

Farms very large, 1600 or 2000 acres of sheep farm being frequently to be met with. Many of the most extensive great farmers. Losses of twenty-one years common till the beginning of the present century, now less shorter periods.

nance and patronage given to them above the other tenants of the day. These men give nominally a large rent for their farms; but as their maxims is to pay neither repairs, tithes, or parochial taxes of any description (these dues and services being all included in the rent received by the landlord), I have strong doubts whether the advantages held out to the land-owners will be very long, or whether they may not yet cash into their pockets. In strong loamy counties, or in rich sands, I am aware much profit may be made by an economical system of husbandry in the tillage; but the practice of the Scots farmers not embracing sheep, or water-meads, will never make them rich on the Dorset farms of Wiltshire; and if the Dorset be broken up by the tenant, who have no stock to maintain them, the land and the farmer will soon come to poverty together." (*Darwin's* 74-5.) Among these farmers was the unfortunate Goulay, who was ultimately ruined by the speculation. Of his farming we know nothing, nor are we aware what description of Scotch farmers they have been whose husbandry in an inland turn of district did not embrace sheep. On the Earl of Suffolk's estate at Charlton, some Berwickshire farmers were introduced in part through our means, whose chief object was the sheep system. Lord Suffolk, however, who is a weak man, without an opinion of his own, got so alarmed by his family at the idea of breaking up the land, that they bought up the leases of these farmers almost as soon as they were granted.

The arable part of this district is on the north-west verge, being a part of the Cotswolds hills, and treated like them.

Grass land prevails almost to the exclusion of arable on all the wet and heavy lands; their management of late much improved by draining, manuring, winter burning, early mowing, and feeding and mowing every piece of land alternately. The grand object in these improvements is, to get an early bite for the cattle in the spring, and thereby, in fact, to shorten the winter.

The cheese of this district was many years sold in the London market by the name of Gloucester cheese; but it is now perfectly well known by the name of "North Wiltshire Cheese." It was at first, doubtless, an imitation, and perhaps an humble one, of that made in the vale of Gloucester, but it is now allowed by many to be at least equal, if not superior, to the cheese of the favorite district of Gloucestershire, the hundred of Berkeley.

Gardens not numerous; some near Wootton Bassett, for supplying the markets of Cricklade, Cirencester, &c.

Orchards frequent as an appendage to farm-houses, but no cider made.

Wood frequent in hedgerows, but not in masses.

Irrigation not common; springs scanty, and land too absorbent; alleged they produce coarse grass, but this is owing to its not being mown in time.

6. Live Stock.

Cattle of the long horned breed; Devons bred, and found better for fattening, but it is questionable if they are so good for the dairy. Breeding cattle not the fashion. "The dairy men say, that the advantages which their situation gives them of sending their veal to London and Bath markets, makes it more their interest to fat their calves than to wean them for stock; but the opponents of the long horned cows say, that the ewes are generally so ugly, and the heifers frequently such bad milkers, that the farmers are never certain of breeding such as they would wish to keep; and therefore, they prefer buying cows (of which they can have a choice) to breeding them, and to use horses for the plough instead of oxen."

Many sheep bred in the district; some for folding, and others purposely for fattening; for the kind to which to select, and the kind to stand still necessary; the Wiltshire answers the farmer purpose, and the Leicester the latter.

There are yet left in North Wiltshire a few flocks of the native Wiltshire horned sheep, possessing qualities of perfection, both for folding and fattening. They stand short in the leg, with wool under their bellies; are wide and heavy in the hind quarters, light in the fore quarter, and in all their offals, with the Roman nose, and quick piercing eyes. These are in the hands of a few farmers near Broad Hinton.

7. Political Economy.

As applicable to both districts it is observed, that the turnpike roads are numerous and good in most places; three canals; one of woollen manufactures; the Salisbury; also carpet, superior excellence there; carpets at Wilton, and fancy woollens; and of superfine broad cloths at a great many places. No agricultural society, but many farmers and others are members of the Bath and West of England Society.

5. Implements.

Two sorts of uncouth wheel-plough in use. Small's plough tried one or two places; from the difficulty of ploughing light soils wheels are deemed an advantageous appendage to whatever sort of plough is adopted. Threshing, winnowing, and various other modern implements introduced in a number of places. The watted hurdles of Dorsetshire consist almost invariably of ten stakes, which the hurdle-makers drive into anger holes, that are made for that purpose in a piece of timber, which is supported at a convenient height from the ground by other pieces of timber, and then the stakes are watted. Stakes set on edge, and rubestone walls used as fences in various parts.

6. Arable Land.

Deep ploughing generally less approved of on the chalky soils, and cross ploughing never practised, even for turnips; two or three horses form a team. Following general all along the coast; but what is here termed a summer fallow, is, in most cases, no other than the mere wain of dry ground, and of wheat, by ploughing it three or four times. The first ploughing being given in June or July, and sometimes as late as August.

Upon the thin chalky soils around Blandford, and upon the hills in the neighbourhood of Salisbury, the course of crops with the best farmers is as follows: viz. corn, &c. of the land

is in sainfoin, and the rest of the sward is cultivated in the rotation of, one, wheat; two, rye, winter barley, or winter vetches, to be fed with sheep in the spring, and the whole followed by turnips, rape, &c.; three, barley or oats; and four and five, artificial grasses, to be followed by wheat as before.

Upon the thin chalks and shallow flinty lands, wheat is generally sown on the back of a two-year clover ley, but even on those thin soils, a great deal is sown after turnips, rape, &c. fed off with sheep early enough to sow it in the same autumn, and in most instances a good crop is produced of a fine sample. On the better soils of chalky and gravelly soils, the same practice prevails, except upon the heavy soils, which continue in grass but one year instead of two: the wheat is taken after the first year's ley, and is supposed to answer better than it would in the second year, upon the latter description of soils. Old sainfoin leys broken up without pairing and burning. Hemp and flax a good deal cultivated.

7. Grass.

300,000 acres, or about three-fifths of the county; 6000 acres of meadow in the chalky district irrigated. Application of the meadows, fattening cattle, and of the uplands the dairy.

8. Gardens and Orchards.

Both are frequent appendages to farm-houses and cottages; some of the cottage gardens are small enclosures taken from the sides of the highways. The goosefoot (*Cheopodium bonus Americanus*) cultivated by a few persons here, as in Lincolnshire and elsewhere, and called here by the name of *Butcher's*, to shew what would be the expenses and profits of an acre for the London market. The plant is greatly inferior to spinach, but might be used as a substitute for it in spring, as it is a perennial, and very early in leaf. Sea-celery, which grows on the shores near Bampton, is now generally introduced into the gardens of farmers.

Orchards to the extent of 10,000 acres; application cider; in making which hops are sometimes added to make it keep; proportion one pound to a hoghead. Twenty bushels of apples will make a hoghead of cider.

9. Woods and Plantations.

Timber scarce, and chiefly to be found in parks and hedges. Many young plantations lately made on the heath lands.

10. Improvements.

Irrigation carried to considerable extent and great perfection, and one of the best books on the subject is by Boswell, of Fiddletown. A dry meadow of good quality is worth forty shillings; watered, sixty-five shillings per acre; produce of hay two loads per acre. The streams in Dorset are in general shallow, and have a considerable fall; the meadows are narrow, and the water is supplied with comparative regularity, in consequence of its having to filter through immense masses of chalk previous to its exit at the springs; and hence the process of irrigation is much facilitated.

The sheep of Dorsetshire are well known as supplying the metropolis with house-lamb at a very early season. Parkinson considers the Dorset ewe as the best horned ewe in the kingdom, those of Somerset excepted, and they are so nearly alike, that few people, excepting the natives of the two counties, would know the difference. In the Isle of Portland there is a small breed, which some contend is the true breed of the county. Lowman, of Portland, observes, it is the practice there to fold these dwarfish animals from Candemas to Martinide, putting them in late at night, and letting them out early in the morning. The mutton is deemed the best in England, and the wool as good as the South Down kind. Some of them have been purchased by sheep-breeders, with a view to obtain a cross between these and the Merinos. Both ewes and wethers are kept, and generally till they are five years old; sometimes they

remain till a greater age, but it is not thought a profitable method. Such as are folded are put into a common fold in the northern part of the island, which is pretty good land, and remain there from the 12th of August to the 26th of November, on which day Portland sheep-fair is held. All the sheep of the island are kept pretty generally upon the commons from November till the 31st of Candemas. The Portland mutton is sold by the quarter in general at ten shillings and sixpence. It is never weighed, but would come to one shilling a pound when common mutton is only seven-pence: it seldom weighs more than ten pounds a quarter. Several flocks of pure Merinos, Down Merinos, and other breeds are kept.

General management of sheep. The lambs which are bred for the regular supply of the flock, are dropped at Christmas, or soon afterwards, and the couples are kept in the best ewe-leazes, &c. on grass, hay, and turnips, if necessary; and such as have weaned meadows, depasture their sheep there, on the early grass, till May-day, when the lambs are weaned, and the sheep go to fold; but sometimes the two latter circumstances take place as early as Lady-day. The ewes are folded constantly, and kept on the Downs, on artificial grasses and other pastures, till near the ensuing Christmas, at which time they have another crop of lambs, the rams having been put to the flock about the end of July.

There is, probably, no part of England where the practice of sheep-folding is more admired, or more earnestly pursued, than in the county of Dorset. Fifteen dozen of hurdles, with a like number of stakes and withes to confine them together, will enclose the 500 or 600 sheep of a fold, and the fold of 1000 or 1300 sheep very commodiously. The hurdles are moved every morning, consequently the same number of sheep will manure an acre of land daily. The real value of the fold there is no means of ascertaining; it is, undoubtedly, very beneficial to the sward land, but it has reduced the Downs to a state of poverty.

Ewes are generally kept till they are four years and a half old, when they are sold to the dealers. A singular custom prevails of coloring them with ochre, for which no other reason is given than that of being able to distinguish them from the Somerset sheep.

Asses were formerly kept by some farmers, but are now given up, having been found destructive to hedges, &c. It appeared that six asses would plough as much land of any kind in a given time as three horses, and four asses were sufficient to plough broken land. It is believed that two asses will perform as much work as one horse, and they do it more conveniently in the hilly part of the county, as they carry their lading in panniers, where it would be difficult to use wheel carriages.

Geese kept on the corn pastures in Purbeck, from an idea that they promote the health of the cattle.

Ewes kept in various places; does not answer to feed them; the only way to render them profitable is, after the honey-season to destroy all hives under twenty pounds weight.

11. Political Economy.

Roads of flint, and in general good: an iron railway, of three miles and a half, for conveying potters' clay from Norden to a place opposite Poole, where it is shipped for Liverpool. No canals. Manufacturers of flax and hemp at Bridport and Beaminster, upwards of 2000 people employed in making sail-cloth, cordage, sacking, tarpaulin, &c.; hamel at Shaftsbury, and woollens at Lyme Regis; twisting and making up; silk into skeins at Sherbourne and other places; shirt buttons extensively, at Shaftsbury, Blandford; and the surrounding villages; the buttons made of wire and thread; many thousands of children in the manufacture of the wooden ladders, with a small hole at top, called lobster pots, at various places on the coast, and a variety of other articles. Many very uncommon provincial terms used in this county.

7034. SOMERSETSHIRE. About one million of acres, chiefly of meadow and pasture land, hilly and mountainous in some places, and with marshes and bogs in others, but on the whole, though far behind in artificial culture, celebrated for its natural fertility. The climate is various, in general cold and boisterous on the elevated parts, but almost without a winter near the sea. The county is divided into the north-east, middle, and south-west districts, by its very able reporter, J. Billingsley, Esq. of Ashwick Grove. (*Billingsley's General View, 1797. Marshal's Review, 1817.*)

7035. North-east District.

Surface very irregular, intermixed with lofty hills and rich fertile plains: climate various; soil chiefly clay, and in part peat; application chiefly pasturage; several thousands of acres overflowed by the tide in the river Tye; 4000 acres protected by a wall of stone and lime, ten feet above the level of the land within, but high tides frequently break over it and make breaches.

Minerals. Lead and calamine in the Mendip hills, but little worked, for want of a proper level to carry off the water. Coal-boulders, and the produce of such, in the Wiltshire, and Somersetshire, from 800 to 1000 tons raised weekly.

Property. Many large proprietors from 2000L to 6000L per annum, but the greater part in the possession of respectable yeomanry, from 50L to 500L a year.

Buildings. There are many splendid gentlemen's seats, or named with extensive plantations, in this district, and the farm-houses and cottages are for the most part commodious and comfortable; but on all the dairy farms, a shameful inattention prevails in respect to outhouses and sheds for their stock to retire to in the winter months. Cattle are almost universally served with their provender in the field; and many a dairy farmer, with twenty cows, scarcely makes, in the whole winter, a quantity of dung sufficient to manure one acre of land.

Occupation. Farms seldom exceed 500L a year; some of the dairy farms are so small as not to exceed 60L or 70L per year; and many instances, the produce of such, in the Wiltshire, bringing up a large family in very respectable way. In such instances, it is generally found that the wife undertakes the whole management of the cows, and the husband goes to daily labor.

Implement. Plough with a foot or wheel; spade with the blade curved in its breadth, to prevent adhesion of soil: it is much narrower, and longer than those used in other counties, eighteen inches by six inches.

Arable land but in small proportion, and little attended to. Tansies and woad grown for the clothiers; potatoes cultivated to a very considerable extent. The Reporter has known thirty-

two successive crops of potatoes, from the same field, and the produce as good as the latter part of the term as at the beginning. This will puzzle the theorist, with his peculiar substances of nutrition. A sack of potatoes is equal to 100 weight of hay.

Grass, the predominating surface. "On the rich marsh land near the Bristol Channel, the grazing system prevails. In the vicinity of Bristol and Bath, the scythe is in constant use; and at a greater distance nothing is scarcer than the scything; the soil: on the stone-brash, and freestone grit soil, saintfoin takes the lead: next to saintfoin, rye grass, marl grass, and white Dutch clover are in deserved repute, when the land is intended to remain some years in grass; but when it is intended to be ploughed again in the course of a year or two, broad clover is preferred to all others.

Hay Tye, (837-) much in use, by which means it is considered as good nourishment is obtained, as if the hay were eaten, while after boiling, the culms may be dried and used as litter.

Market Gardens for the supply of Bristol and Bath. A clergyman has eight or ten acres of nursery ground, the labor of which amounts to 25L per acre.

Orchards abound throughout the whole district; the favorite apple, both as a table and cider fruit, is the court of wick pipin, a seedling from the golden pipin.

Woods and plantations not numerous.

Live Stock. Cattle mostly short horned; the long horned breed of North Wiltshire have been tried, but the customary breed preferred. Both cheese and butter made.

Roads pretty good; some canals; woollen manufacture, extensive, and that of knit worsted stockings considerable.

7036. Middle District.

Between 4 and 500,000 acres of varied surface and soil, and mild climate; including a great extent of marsh and fen land, great part of which has been drained and embanked. Half this district occupied by the owners. Grass the chief product, farms from 40L to 600L per annum, partly grazed with heifers, but chiefly by cows for the dairy: the cows let out to dairymen, as in Dorsetshire.

Arable Land, flax and hemp extensively cultivated, and also turnips.

Orchards numerous and very productive; soil particularly suitable; plantations few.

Live Stock. Small cows, well fed, preferred for the dairy, and the object chiefly chosen; that of Cheddar much admired; the others in general sold in London as double Gloucester. A dairy maid can manage the milk of twenty cows.

Roads excellent, especially from Wells to Bridgewater; extensive woollen manufactures, many of hemp and flax, and some of gloves.

7057. South West District.

Rough mountainous hills, and rich fertile slopes and plains; farms rather less than in the last district, but the husbandry much the same; more land in tillage; mountains uncultivated, and pasture with sheep and young bullocks; in the vicinity of these hills, the principal corn crop is oats.

Fences. The beech hedges around Dulverton, Dunster, &c. are not only beautiful to the eye, and excellent fences and shelter, but are a source of annual profit to the proprietors. The banks on which they are planted, are six or seven feet high,

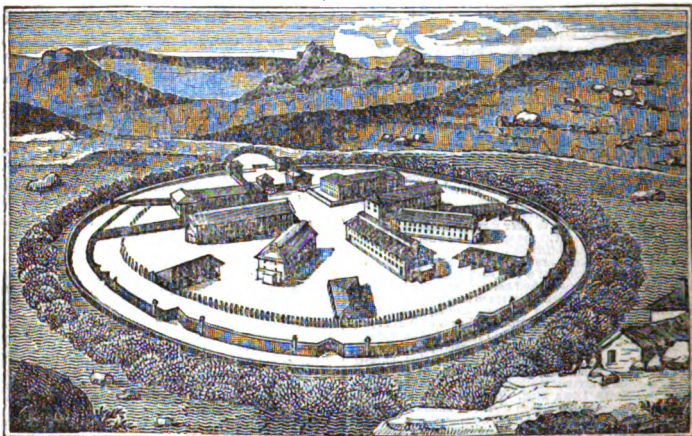
and between four and five feet wide at the top; the moultering of the sides is frequently prevented by a dry stone wall, four feet high. There is no ditch; and the hedge consists of three rows of beech, planted on the top of the bank, at about one foot distance. Their growth is very rapid, and they seem to defy the destructive qualities of the sea breezes, so fatal to the white-thorn, and most other plants; when at maturity, the middle row is cut to the ground, and the outside rows plashed. The quantity of fuel supplied by these hedges is very considerable; and the only objection that can be made to them is, that the earth used in the construction of the banks is so considerable a quantity, that a large portion of the field is robbed of its vegetable matter, and rendered for some years unproductive.

Some Norfolk farmers introduced on the Barnard estate, and rhubarb cultivated to great perfection by Ball, at Wilton, near Watchet. Many orchards, and excellent cider made; not much wood, but elms attain to a large size in the hedges.

Live Stock. North Devon cattle, and Dorset sheep used round Taunton Dean; oxen worked chiefly in yokes. Manufactures at Taunton on the decline. A salmon and herring fishery at Perlick, Minehead, and Watchet.

7058. DEVONSHIRE. 1,595,309 acres of strongly marked hilly surface, including the vale of Exeter, "the garden of the west," the Forest of Dartmoor, a barren waste, and North, West, South, and East Devonshire, each with distinct features. The county is celebrated for its breed of cattle, its dairy, and its orchards, and of late years for extensive improvements undertaken in Dartmoor, where is also the immense depot for 10,000 prisoners of war. (*fig. 800.*) (*Tyrrwhitt's Tracts on the Improvements at Dartmoor, 1819. Fraser's General View, 1794. Vancouver's View, 1807. Marshal's Review, 1817.*)

800



1. Geographical State and Circumstances.

Climate in North Devon less mild than in South Devon, but still myrtles are used as garden hedges; in South Devon the climate is supposed more mild and salubrious than in any other part of England.

Soil in great variety, but in general calcareous.

Minerals. Some iron and copper worked, also freestone, limestone, and marble, &c.

2. Property.

Much divided, only a few large estates; formerly letting for lives much in use. "It has frequently happened, that in letting an estate, the landlord agreed to discharge tithes and all parochial payments. About the years 1800 and 1801, the rent of several estates in this county was absolutely insufficient to meet such disbursements, and consequently all the estates so circumstanced, brought their proprietors in debt.

3 Buildings.

Houses of proprietors too generally going to ruin from non-residence. "We defy ingenuity to plan and place farm-houses worse than they are." "Garden-walls, farm houses, barns, stables, lime kilns, village fences, and cottages, are all built with mud, and left without rough cast, or white wash, to conceal the native color of the loam."

4. Occupation.

Farms of all sizes from 10^l. to 500^l. a year.

5. Implements.

Plough of the swing kind, with a wooden mould board. Scarifiers, called tormentors. Two sorts of grubbing mattocks are in use (*fig. 801 a, b*), one called the hoe mattock (*a*), and the other a two till or double bitted mattock (*b*). Paring shovels (*c*) are very well constructed. Corn stacks in harvest secured from the sudden and heavy thunder showers, to which this country is liable, by canvas coverings, like those used in Mid-America for covering hay racks.

6. Arable Land.

Much less than the grass and; not much to be learn-

ed from its culture; artificial herbage not generally sown, and rotations bad.

7. Grass Land.

In the low tracts of good quality; application, breeding and the dairy; better good, cheese indifferent; and generally consumed in the county.

8. Orchards, Woods, and Plantations.

Very abundant in most parts of the county, and excellent cider made in the Herefordshire manner. Fruit trees rather neglected as others here; generally pasture beneath; often in the hedgerows.

The Forest of Dartmoor belongs to the Prince of Wales, and is parcel of the Duchy of Cornwall; extensive improvements have lately been proposed, and in part carried into execution, under the direction of Sir J. Tyrwhitt, the steward of the Duchy. Extensive salt marshes on some parts of the coast.

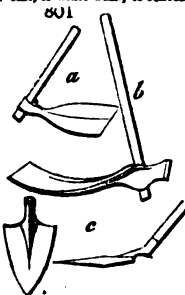
9. Improvements.

Draining and irrigation not much practised. The Rev. M. Froude of Darlington parsonage, communicated to Vancouver, a mode of emptying the water from a pond without the necessity of attending to it personally when full. It is more matter of curiosity than ingenuity or use. The water when the pond is overflowing, flows by a gutter into a basin, suspended beyond the head, which when full, by means of a lever, raises a plug at the bottom of the pond. After a time, the box being leaky, it becomes empty, and when the pond is nearly empty, the plug re-drops in its place. If the plug were placed nearer the surface of the water, it would in general cause no more useful and less likely to lose the fish.

10. Live Stock.

The North Devon cattle well known for their superior adaptation, both for feeding and draught. For the uses of the dairy or for milk, it is a breed by no means held in general estimation, its true aptitude to look well (without being fleshy), is derived from the peculiar nature of the animal, which disposes its accretions in the accumulation of fat, rather than in the production of milk. For the purposes of labor, this breed can no where be excelled for docility, activity, or hardihood, in proof of which no stronger circumstance can be adduced, than that it is a common day's work, on fallow land, for four steers to plough two acres with a double-furrow plough, and that a general use is thus made of them, and for most of the other purposes of draught in the county where they were originally found; and in others to which they have been since transplanted.

The rules generally pursued in breeding and raising this va-



liable animal, may be considered as follow. The greatest number of calves fall between Candiana and May, and some much later; but among the best breeders, such late calves are not so generally approved of. The usual mode of raising them, is to let the calf suck as much as it will three times a day, for the first week; then bring it to the finger, and feed it with warm milk, in like manner for three weeks longer. This is the ordinary treatment for the first month, and the calf is then fed for two months longer, twice a day, with as much warm scalded skimmed milk as it will drink; when, gradually abating its morning and evening meals, at the end of four months the animal is weaned from all milk draughts, and left to itself. Small portions of finely pounded linseed cakes are often used, and recommended to be mixed with the skimmed milk, particularly in the first period of its being given in the place of new milk.

The full sized North Devon cow, when fattened to its frame, will not exceed eight score per quarter; and the ordinary average of its ox, at five years old, and equally well fattened, must not be rated higher than three score per quarter above the weight of its fattened mother.

The usual practice in this district, is to sell the steers, at four or five years old, to the graziers in the county of Somerset, who send them for a supply to Bath, Bristol, and London markets. Very few in the proportion raised, are fed in the district, which may in a great measure be ascribed to the great indiffidence hitherto manifested in the culture of green food for a winter supply; and for which, indeed, a sufficient reason may be drawn, from the deplorable waste of stock, which the lands are suffered to remain for want of draining.

In South Devon we find a mixture of the North Devon with a larger animal of the same kind, called the Old Marlborough Red. This breed is said to have originated from the South Malton stock, although at this time they differ very materially from them in size, and in having dirty brown, or rather blackish color at the ears, nose, and encircling the eyes, and in all such parts as the orange hue prevails in the genuine North Devon breed. A cross with this breed is however much preferred, as it produces a greater aptitude to fatten in a given time, than is experienced in the South Devon stock, which in all its points is a much coarser animal, and produces a greater offal. There does not appear to be any particular choice with regard to color in this breed.

Sheep. The Exmoor breed, a horned animal, with a moderately long staple of wool, which heretofore, and before the cloth manufacture fled from this county into Devon, is much used by the clothiers of North and South Malton, Cullumpton, Thorverton, Tiverton, and other places in the county.

The sheep most approved in the division of Tiverton, are the Bampton Notts. The first cross of this breed with the New Leicester is growing greatly in esteem, from its improving the form, and bringing the animal to the nearest stock to market.

The sheep generally depastured on the moorlands, are the Exmoor, Dartmoor, and the light hardy breed of the lower moors and commons in the county. The autumnal rains frequently inundating the cold clay lands, are very apt to occasion the caw, or rot among them, and which has been sometimes experienced to almost the extent.

The Merinos, Rylands, Downs, and other fashionable breeds have been tried by amateurs; but Devon is less a sheep than a cattle county. Native breed of hogs large, and long legged.

Horses, a small compact breed; with the exception of the farm-horses in Ireland, those in Devonshire have perhaps as hard a measure of time, and of the same deal of rest to them, as is any where to be met with in the united kingdom.

11. Political Economy.

Had the roads of this county been laid out in the judicious manner practised by the Indians of North America, they would have been found to follow the water courses in all cases where they might lead in their general direction, towards the point assigned for carrying them off. In doing this, infinitely more judgment would have been displayed, and a far greater benefit secured to posterity, than in that which has been adopted by the original projectors of some of the most important and most frequented roads in this county. This is clearly demonstrated by the road between Dartmouth and Chudleigh, which, instead of being conducted through the valley of the Taw, is carried over the highest rocks of the river hills, where the traveller is unceasingly compelled to ascend and descend the sharpest hills in the county. The same may be said of the road between Bideford and Torrington, by the great omission of its not being carried along the foot of the river hills, and through the valley of the Torridge river.

Manufactures of woollens of various sorts were formerly con-

709. CORNWALL. A peninsular hilly surface, of 753,484 acres, remarkable for its mines, and of late greatly improved in its agriculture, the object of which is chiefly corn. It is the country of Sir H. Davy, who may be considered as having eminently contributed to agricultural science by his agricultural chemistry. The inhabitants have been remarkable from the time of the Romans for their mildness and complacency of temper, urbanity, hospitality, courteousness, and liberality. (*Fraser's Cornwall*, 1794. *Bargan's Cornwall*, 1810. *Marshall's Review*, 1817.)

1. Geographical State and Circumstances.

Climate, like that of other peninsular situations lying far to the south and west, inconstant as to wind and rain, and mild as to heat and cold. Plants, shrubs, and even the most hardy trees on the sea-coast, sustain much injury from the violence of the westerly wind, and the salt spray of the sea, which drives with great force before it; hence crops of wheat and turnips have been totally destroyed. After a storm, the plants have their roots much torn, and their leaves corroded and shrivelled as if scorched, and taste of a pungent saltiness. Trees and shrubs shrink and lean away to the eastward, and appear as if clipped by the gardener's shears. The only shrub which seems to bear the sea air is the tamarisk. The surface remarkably unequal; ascents and descents follow in rapid succession; some hills very steep.

Soil generally slaty, and loamy, mixed in a manner that renders it almost impossible to designate the boundaries and extent of each.

Mines chiefly tin and copper; for the former Cornwall has been famous from the remotest antiquity, as some think, from the days of the Phœnicians.

mon; but are at present on the decline; many manufactures and works employing numerous hands at Plymouth. Two agricultural societies, but both ill attended and on the decline.

Education of the Poor, or Lower Classes. Vancouver concludes his report by some pages of observations which, happily, are seldom equalled in illiberality, and viewing the subject as we do, they compel us to look on him as an enemy to human nature, and to turn from his book, his name, and memory with feelings of dislike. "It is an incontrovertible truth," he says, "that the restless disposition of the Irish, and their emigration to America, is owing to their being generally instructed to read and write. The disposition of the Scotch and Germans to emigrate, arises from the same reason, and the English peasant under the same influence, will be acted on in the same manner." He "respectfully submits to the consideration of the Honorable Board, the propriety of opposing any measure that may rationally be supposed to lead to such a fatal issue."

Marshall, whose considerate and humane spirit justly objects to the term peasantry, as at all applicable to the operative classes of Britain, has the following excellent remarks on this subject.

"With respect to the emigration of the Irish, 'well it is,' he says, 'for Ireland and America, that they so. The land is overstocked with the class that furnishes war-people; the other wants enlightened workmen. Of slaves and savages it has enow. The unlettered Irish stay at home, to riot, plot, and murder; to commit acts of treason, stratagem, and spoil; or emigrate to England, to revel, awhile, in outrage, and be hanged.'

On Vancouver's ideas on education, he observes, "After some other groundless arguments, the Reporter sums up in Italics, and with the aid of foreign tongues, in the following ultra-royal manner. 'In short, the peasant's mind should never be inspired with a desire to amend his circumstances, by the quitting of his soil' (this, says M., is Hindoo), 'but every means the most benevolent and feeling heart can desire, should be employed to make that situation as comfortable and as happy to him as possible; and to which end nothing more essential could contribute than by exciting a general emulation to excel in all their avocations, even to those of breaking stones for a lime-kiln, or for repairing the high-ways.' 'Hear, hear!' says M.—'This is English.' Good heaven! And is there an Englishman (or a Dutchman — they are brothers in sentiment) with nerve enough to write the two first lines above quoted!!! He surely could not know that many men of 'the brightest genius,' and who are much more estimable members of a community; many great and good men — have, in England, been moulded and nurtured in the 'peasant cast.'

"Fortunately for society, in England, the writer's exotic notions have not been taken up, for civilizing the children of the laboring classes, have been, and are rapidly increasing."

"In a civilized nation, early schooling tends to reclaim children from savage propensities, and to prepare them for civil society; it inculcates a propriety of behavior, one of the very first lessons a child should be induced to learn in a civilized nation. In the savage state, savage manners may be deemed a virtue, as being, in that state, conducive to self-preservation."

"Attendance in a school inures children to a requisite degree of restraint; and a division of time, employs their minds, and prevents idleness, and other vicious habits, from taking root; thus tending to raise them to the rank of rational beings. While the unfortunate offspring of indigence, that are suffered to loiter away their early days on commons, in lanes, and by-places, acquire habits of indolence and pilfering; give a loose to their wild and unrestrained tempers; commit acts of mischief, and add to them the guilt of lying, (the seed-bed of fraud) to screen them from correction."

"The discipline of a well-governed school impresses on youthful minds subordination, industry, patience, and its consequent perseverance; and thus habituates them to receive instruction."

Where Vancouver is at present we do not know; we hope he may long live to witness the extension of education which is now taking place, not only in this, but in almost every country in the world; and we hope all those whom he designates peasantry, who may ever happen to read the above extract, will see the necessity of fortifying themselves by knowledge and good conduct, against the degradation attendant upon ignorance and vice.

2. Property.

Very much divided, subdivided, and vexatiously intermixed. Estates from twenty acres to 500 acres, very few exceeding 4000. per annum. Many gentlemen and clergymen in this county occupy their own estates and glebes, and keep their grounds in a very superior state of cultivation. The management of great estates is generally given to attorneys.

Entailed estates. "I was in hopes that I had been a singular sufferer in Cornwall, from this kind of deceptive tenure; it would then not have been a worthy of notice; but many excursions through the county, I have met with fellow-sufferers, and with others who are likely to become so. As such cases have occurred, and may occur again, it behoves every man, who is about to occupy a farm for a term by lease, to make enquiry whether it be an entailed estate or not; because the possessor having the power of letting for his own life only, in case of his death, the occupier is left entirely at the mercy of his successor." (*Fraser's Review*, &c.)

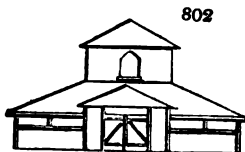
3. Buildings.

Old farm-houses of mud and thatch; the lower divisions consist of a kitchen, and an apartment dignified with the name of

terior, but called (provincially) the higher side, a cellar; and dairy-room, but these latter are frequently under a lean-to roof; the rooms very low, not called, and two bed-chambers over; the floors of the chambers are of oak plank; the ground-floor, earth, lime-ash, or flag-stone.

The farm-offices built of the same materials, consisting of a barn, cow and ox sheds and hog-sties, stand in confusion about the dwelling. The intervening and circumjacent ground is called the farmer's town-place; for as to that essential appendage, a regular farm-yard, it is a convenience not often met with in any part of the county.

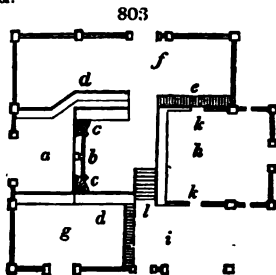
Some good new farmhouses erected centrally on newly inclosed lands. One for forty-six acres has a very neat elevation, (fig. 802.)



and the plan (fig. 803.) contains a feeding place, into which the turnips are carried (the cart being backed into it), and from whence the sheep and oxen are fed (a); place for a yoke of oxen (b), either for soiling or winter-feeding; the oxen are tied to posts (c); there are troughs for turnips (d); cribs, or racks for hay or straw (e); lean-to for store sheep (f); lean-to, in which half a score sheep are kept to fatten, the number being completed again as soon as any are sold (g); fodder house, used as a barn (h); open shed for tools (i); hanging doors with bolt in side, and through which the fodder is handed to supply the cattle, and is thus kept always dry (k); door and staircase leading up to the wool-chamber (l). The stairs rise quick so as to be quite out of the way of the ox feeding in that side of the house.

Cottages. "I had occasion often, in my dreary walks, during my survey, to take shelter in some of these miserable dwellings, and found the poor inhabitants busy in placing their bowls, crocks, and pans, to catch the waters pouring in at the roof. However, the meanest cottage generally has a great source of comfort, a garden, attached to it." Some very comfortable

plans of cottages by Capt. Penson, of Ebury, are described by the surveyor.

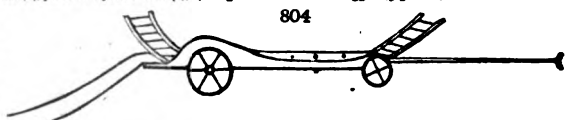


4. Occupation.

Farms from three or four to three or four hundred acres, mostly from thirty to fifty pounds a year. Leases on rack-rented farms generally from fourteen to twenty-one years.

5. Implements.

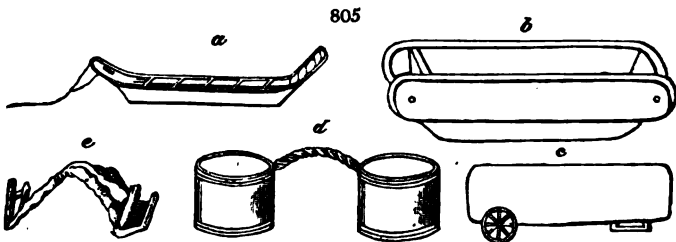
No country affords a greater variety of wheel and other carriages. The harvest waggon (fig. 804.) has a side bulwark



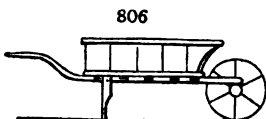
behind, and is open in the middle; it carries about 300 sheaves of corn. When drawn by horses shafts are applied; when by oxen, a pole. An arch of boards over the hind wheels prevents the corn from bearing on them.

The main is another light useful carriage for carrying corn and hay; it consists of a light open long body, borne upon two wheels; a railed arch over the wheels prevents the load from bearing upon them; it will carry from 200 to 250 sheaves, which are secured by ropes, it having no sides or ladders.

A sledge for corn, hay, or faggots (fig. 805 a.); slide butt (b); quarry butt for earth or stones (c); dung-pots or dung-panniers (d) for dung or stones; and panniers with hooks for faggot wood and sheafed corn (e) are also in use.



Box hand barrows and grass barrows (fig. 806.) are also used on a few farms.



The Cornish plough is a small swing plough with a straight piece of wood as a mould board.

Beetle boards for threshing on are four or five planks laid across beams, but about one third of an inch asunder, so that the corn as it is threshed may fall through and not be bruised. In some places, wheat is separated from the straw by beating it on a barrel or inclined plane, usually by women. Fences generally made of stone, or raised banks of stone, slate, and earth sometimes planked.

6. Arable Land.

The piler, or naked oat, cultivated on worn-out ground; its straw very fine, and reckoned nearly as good as hay. A quantity of potatoes exported yearly; but not enough of wheat grown for home consumption.

7. Grass.

Chiefly near towns and villages on sheltered slopes, and the uncultivated lands known as moors, downs, crofts, and wastes; some meadows watered.

8. Gardens.

Common to cottages and farms, and better attended to than in some counties; orchards also attached to many farms.

9. Woods and Plantations not abundant.

10. Improvements.

Draughting practised to a considerable extent, and one or two examples of embanking.

The maritime situation of Cornwall presents the farmer with three valuable manures, fish, sea-sand, and sea-weed. In some years the farmers who live in the vicinity of fishing towns, have an opportunity of buying the bruised and small pilchards; which being deemed unfit for market are rejected, and called "coff"; four cartloads of twelve bushels, are considered as the proper quantity for an acre. The usual mode of management is to bury the coff in a pile of earth, deep enough to secure it from dogs and boys, adding to the pile a sufficient quantity of sand, well mixing and turning all together, after having lain some months. Without this practice, the fish would not decay sufficiently for perhaps a year or two. The fish are sometimes used alone; they are then spread thinly over the ground before the plough, and turned under furrow. One pilchard cut up small, will amply dress one square foot of ground.

The old salt which has been used to cure the pilchard, and judged to be no longer fit for that purpose, is advantageously applied for a barley or a turnip crop; twenty to thirty bushels per acre. It is commonly hand sown, in the manner of corn; and it should remain on the land five or six days before the seed is sown. It is best adapted to light lands, particularly furze crops. Twenty bushels per acre have been sown over grass lands, and over a wheat crop, in the month of March, with evident advantage.

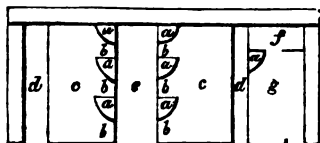
Another article of manure obtained from this useful fish is the liquor which drains from it while under the process of curing, consisting of blood, brine, and some oil which escapes, and which is caught in pite; the diligent farmer carts this away in casks, for the purpose of pouring over and mixing with his piles of earth and sand, which it greatly enriches.

11. Live Stock.

Devonshire cattle prevail, but it is only among the more enlightened and spirited breeders that the genuine North Devon are to be met with. Cows are kept in winter in sheds open to

the south; one of which for seven cows and a fattening calf (fig. 807.), described by the surveyor, contains cribs for hay or straw in winter, and lucern, vetches, &c. in summer (a); troughs for turnips, potatoes, &c. (b); beds or platforms for the cows to stand and lie on (c); gutters sunk two or three inches to receive the dung (d); head-way and feeding place (e); dark place for fattening a calf (f); the division outside (g) for a cow that has, or is near having, a calf. She is not tied up.

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7040. The islands of JERSEY, GUERNSEY, ALDERNEY, and SARK, which lie in the Bay of St. Michel, and form the remnant of the ancient Duchy of Normandy, though naturally belonging to the continent of France, yet, for nine centuries have been subject to the British Government. The agriculture of all of them is nearly the same; but we shall follow the Reporter to the Board of Agriculture in considering first, that of Jersey, and next Guernsey. These islands are chiefly remarkable for their breed of cattle, their parsneps, and the degree of perfection to which many plants arrive in the open air, which are kept in England under glass. (*Quayle's General View, &c. of the Norman Islands, 1812.*)

7041. Jersey. 39,580 acres of warm and rather moist climate, diversified soil, and features; the soil is for the most part light, on granite or schistus, and there is some peat and marsh. No calcareous soil or rocks; granite and gneiss quarries worked; and granite pillars of fifteen feet in length extracted. Water abounds; and belief is still entertained in the efficacy of the diving rod for discovering springs.

1. Property.

Minutely divided, and mostly in the hands of a resident nobility. Some gentlemen have and cultivate as tenants, as for example, the *retrouvailles*, and *retrouvailles* on *foie*; also the legitimization of children not born in wedlock, by the marriage of their parents, as in Scotland, and most other countries of Europe excepting England.

2. Buildings.

Those of all sizes substantially built of stone, sometimes rough cast, neatly lined, and finished with stone work. Farm-houses generally covered with thatch or pantiles. Cottages generally of stone, with a vine in front.

3. Occupation.

Farms small, and fields diminutive; farmers frugal, and their wives good managers and industrious.

4. Implements.

Plough with wheels, resembling that of Hampshire; sometimes drawn by two bullocks, and six or eight horses; a sort of large plough, used for ploughing deep, for parsneps, and held in partnership by several farmers; instances of this plough being drawn by six oxen, and sixteen horses. (p. 64.)

5. Enclosing.

Fields very small and irregularly shaped, and the fences of high earthen mounds, often twelve feet wide at least, and six feet high, crowned with a hedge, or timber trees and pollards.

6. Arable Land.

Soil deep, and deep ploughing generally practised, but no improvement in it for ages; no naked fallows. The spelt wheat (*Triticum spelta*), here called *trémis* *frumentum* *trémis*, here eaten into rotation; it is sown in February, produces short stiff straw, is difficult to thresh, but never lodges. Parsneps are grown by every farmer, and either by the spade culture alone, by the plough and spade, or by the small and great plough; any soil in good heart and tilth suits them; but peculiarly, a deep loam; and in the same spot, generally are raised beans, pease, cabbage, and occasionally potatoes.

When the ploughing or digging is completed, the field is once harrowed; straight lines are then drawn across, by means of a gardener's rake, usually from north to south; women then proceed with dibbles, and set the beans in rows, at a distance of four inches, or five inches from bean to bean; in four, three, and sometimes in two ranks of beans, leaving intervals of between five and six feet, between each of the rows. In the use of the dibble and in dropping the beans, the women have acquired considerable dexterity. In many instances, they are followed by children, who drop into each hole made by the dibble, after the bean, three or four pease; the parsnep seed is then sown, at the rate of one-third to one-sixth of a bushel to the acre.

The parsnep, not usually relished elsewhere as an article of human food, is here consumed by all classes of people; it is eaten with meat, with milk, and with butter; but not, as is the common mode of using it as human food in England, with salt fish; or as in Ireland, together with cream. The next most usual application of this root is hog-feeding; at first it is given to the animal in a raw state, afterwards boiled or steamed, and finally, for a week or a fortnight with bean and oatmeal. A hog, treated in this way, is sufficiently fattened for killing in about six weeks. Its flesh is held superior to that arising from any other food, and does not waste in boiling.

Bullocks are also fattened with parsneps, in about three months; their flesh is here considered of superior flavor to any other beef, and commands, on that account, an additional half-penny in the pound on the price. To milk-cows they are also usually given; on this diet the cream assumes a yellow colour; by the accounts here given, it appears, in proportion to the milk, to be more abundant, than when the animal is kept on any other food whatever. When the cow receives at the rate of thirty-five pounds per day with hay, seven quarts, six measure, of the milk produce seventeen ounces of butter; it is generally allowed, that the flavor of the butter is superior to any other produced in winter.

Geese are sometimes shut up with the hogs, to fatten on parsneps, which they will eat raw. The root is also given boiled; and for a week before killing, they are fed with oats or barley only. Horses eat this root greedily; but in this

The cows are tied to posts by means of a strong chain and rope, which by means of a ring runs on a long staple.

Oxen very generally worked both in plough and cart; shod in iron shoes, and yoked in the harness.

Sheep mixed breed; Cornish breed lost among crosses.

Horses a small hardy active breed, well adapted to the hilly nature of the country.

Cornish hog always white, long-sided, razor-backed animal; crossing by the Devon, Suffolk, and Leicester breed, has taken off length, and sharpness, and added breadth and depth; a mixture of Chinese and Suffolk is another variety.

12. Political Economy.

Public roads tolerably good; lanes bad. Some travellers who met Payan the reporter, however, would notice with apprehension, the straw-traps that the farmers lay in some of the cross-roads, and which, concealing the deep ruts, endanger their horses, gigs, and their own necks.

Manufactures few; some of woollen, carpets, and paper. The three great staple commodities for export, are tin, fish, and copper, the moor-stone, China stone for porcelain, barley, oats, potatoes, and some wheat.

Island it is never given them, as it is alleged, that when on this food, their eyes are injured. About Morlaix, horses are not only continually fed on parsneps, but they are considered as the best of all food, superior even to lucern.

Lucern a good feed cultivated, and found productive. Hops to a moderate extent; the reporter could not find that the tennarium scordonia was employed as a substitute, as related in some botanical works. A species of cyperus (most likely *carex arvensis*), used for twisting into halters and other ropes.

7. Grass Lands.

Very limited extent, but meadows very productive.

8. Gardens and Orchards.

Very productive, and in general carefully attended to. Chaumontelle pears brought to great perfection, and with grapes, bulbs of the Guernsey lily, parsnep seed, and some flower seeds, sent to the London fruiterers and seedsmen.

Orchards generally attached to all farms. Jersey cider is not only much esteemed, and a principal article of export. Most of the farm-houses have large arched doors, made wide on purpose for the passage of cider casks. A valuable work on the subject of cider by the Rev. F. Le Conteur, entitled *Aperçu sur la culture des Pommiers, Jersey, 1806*. The pomel, jamné, noir-tout, and gro-aune, the cider-apples at present in vogue.

9. Woods and Plantations.

Very limited extent, and the waste ground little more so; only about 300 acres of rocky summits of hills; these might be planted.

10. Improvements.

No calcareous manures found on any of the Norman islands. Sea shells tried on clay with great advantage; and sea weeds (*eric* when green) used in a simple manner, practised in the narrow valleys from time immemorial. Sea encroaching in some places, and jetties and embankments proposed, but nothing done.

11. Live Stock.

Allderney cattle well known. Though there can be no doubt that the breed was derived from the contiguous continental coast, yet it is not known that in any part of it at present, the same breed is preserved in equal purity. Next, perhaps, to the possession of *eric*, the treasure highest in a Jerseyman's estimation, is his cow. She seems to be a constant object of his thoughts and attention: that attention she certainly deserves, but she absorbs it too exclusively; his horse he treats unkindly; his sheep most barbarously; but on this idolized cow, his affections are riveted as firmly as those of an eastern Braham on the same animal. It is true that in summer she must submit to be staked to the ground; but five and six times in the year she is shifted. In winter she is warmly housed by night, and fed with the precious parsnep. When she calves she is regaled with toast, and with the nectar of the island, cider, to which powdered ginger is added. Could she be prevailed upon to participate in all her master's tastes, there is no doubt but that he would willingly bestow on her the quintessence of *eric* itself.

To guard the purity of her genealogy, and to prevent others from being conveyed to England, under the semblance of Jersey cows, he has invoked the interference of the Insular legislature. On the 8th of August, 1789, an act of the States passed, by which the importation into Jersey of cow, heifer, calf, or bull, is prohibited under the penalty of 200 livres, with the forfeiture of boat and tackle. A fine of fifty livres is also imposed on every sailor on board, who does not inform of the attempt. The offending animal is to be slaughtered, without mercy on the spot, and its flesh distributed among the poor. The same act of the States directs, that when cattle of the enumerated descriptions are exported, a certificate of their being natives of the island is to accompany them. On the vessel's return, another certificate is required, that the same identical number, and no more, have been landed.

There is indeed, at present, little danger of the occurrence of that evil, which the Jersey-man so much deprecates, for he will not speedily become a convert to any heretical opinions which he may happen to hear from an Englishman; for in this, as in every thing else, it may be observed, that the rooted opinions of a people are more powerful than any law.

The oxen are distinguished by rising to a stature and bulk

much superior to the female. Persons who have not seen any other than Alderney cows, would be surprised to witness the size attained by some oxen of the same breed, which may be seen in the Jersey carts.

The object of the dairy is butter: the cows are milked thrice a day from the middle of April to the middle of July, and twice a day during the rest of the year; the milk is kept in glazed earthen-ware dishes till it throws up the cream, which is separated, kept five or six days, and then churned by itself. The prime milkers are not generally exported. After the young cow has borne a calf or two, it is sometimes significantly remarked, "qu'elle est bonne pour l'Angleterre;" and she goes to the cow-jobber.

As to the merits of the Jersey cows the reporter observes, if the palm can be contested with them by any, it will be by a breed little known in the south, the Dunlop (in Ayrshire) cattle, a cross between the short-horned and the Alderney.

Sheep a bad shouldered coarse boned breed, small horned, and between a black and brown color; largest flock in the island forty; weight of carcass fifty pounds; in the winter many perish from want, and many by drought.

Horses a hardly small breed, very ill treated.

Swine, white, long-legged, flap-eared.

Geese are plucked alive, when the feathers drop, as an article

of economy, and also to prevent the grazing-ground being injured. It is also thought a relief to the animal.

Pigeons. Here, as in France, the *Droit de Columbar* is attached to certain residences; but not exclusively, as appeared to be the case in France, to those held by a noble tenure.

Bees. The flavor of Jersey honey highly wanted, probably from the numerous flowering plants, legumes, fruit trees, garden plants left to seed, &c.

12. Political Economy.

Roads numerous, narrow winding, crossing each other, and consequently intricate; flanked by high earthen fences over-crowded by trees. In rainy weather they are crevasses of mud. Two carts meeting each other on the *chemin de fer*, could not pass; one or the other must back till it reached the nearest field; gateway, or some other recess, to which it might retreat, during the passage of the other. To this little circumstance in their internal economy, and the disputes which it engendered, may, perhaps, in part, be attributed the remarkable proficiency of the Jersey population in swearing.

Manufactures few: some boots, shoes, and cordage exported: an oyster fishery to the east of the island. English law as to poor rates exists; but as the poor are few, it is not necessary to act on it. Dialect of Jersey a corrupted French, and a bad English.

7042. Guernsey. A rocky hilly surface, of which 8000 acres are under cultivation; the climate rather moister than that of Jersey, and the soil generally light, on granite, gneiss, or schistus. The operative classes resemble those of England more than those of Jersey.

Agriculture much the same as in Jersey; Guernsey figs much esteemed. Some land embanked and sold with permission of government, and the produce applied to improving the roads.

Live Stock. Guernsey cattle are larger-boned, taller, in every respect more stout and coarsely made than those of Jersey. The front is wide, horns divergent and thick, but not long; never with the graceful short curve observed in some Jersey cattle, and in the short-horned breed. The dewlap is also coarse and pendulous. They are deep-chested, and the carcass, compared with their neighbors, more bulky. Their coat is also not so fine; and the colors, though varying as in Jersey, on the whole appear more dark. Some, but not so many, are found cream-colored, and the breed may safely be pronounced more stout and hardy. In one respect, a similarity appears in the best milkers of each island: these are observed to have a yellow circle round the eye; the hide yellowish; and in particular, the skin of the tail at its extremity appears of a deep yellow, approaching an orange color. The same circumstance has been since observed to exist in good milkers of other breeds; but in Guernsey at least, on examination, this yellowness is general and striking. The butter produced by the milk of each breed is also naturally of a rich yellow color.

As to the question of superiority between the cattle of either island, it is settled most decidedly by the inhabitants of each, as may be supposed, in their own favor. The people of Jersey have gone furthest in support of their opinion. By the third

section of their law, of 1789, respecting cattle, they expressly apply "aux fins volantes," the same penalties and restriction on importation of cows, heifers, and bulls, as on importation from any other quarter. Into Guernsey, where no similar restrictions exist, Jersey cows have occasionally been imported. The comparison between cows of each breed, as milkers, leads to that result which, in the place where it is made, might be anticipated.

Next it may be noticed, that though the exportation of Guernsey cows, compared with that of the same animals in Jersey, is not extensive, yet that their price in Guernsey is higher. One was noticed for which a farmer had offered a price of thirty guineas, for his own use; and the offer refused. As to the quality of the butter also, in each island, it may be observed, that the preference is usually given to that of Guernsey. In this article indeed, in some degree the difference may arise from their different practices in the process of churning. The cream is here left unskimmed, till the milk becomes coagulated: on the third day milk and cream are churned together. A little attention has yet been given to the improvement of the breed of cattle, and Jersey.

Roads improved under the government of Sir John Davis. Bricks and tiles manufactured, and some spirits, which formerly found its way into England, under the name of French brandy.

SECT. II. Agricultural Survey of Wales.

7043. A hilly mountainous surface of 5,206,900 acres, with a climate colder than that of England, and more moist in the proportion of thirty-four, the average number of the inches of rain which falls in Wales, to twenty-two, the number for England. The soil is generally of an inferior description, and the great proportion of mountainous surface is fit only for pasturage and planting. Little exertion was made in cultivation till the middle of the eighteenth century: from that period to the present, agriculture has been gradually improving. A general view of it, as in 1809, has been published by the Rev. W. Davis, of Montgomeryshire, whose work we shall adopt as our guide.

7044. NORTH WALES. 1,974,510 acres, chiefly of mountainous surface, in six counties, including the Isle of Anglesea. The climate humid and cold in elevated situations, but warmer in the vales and near the sea. The soil moory, coarse, clayey, and otherwise unfavorable in most places, excepting in the vales on the banks of streams. Minerals chiefly copper, lead, and iron. The famous Mona and Farris Copper Mines in Anglesea, have been worked since 1768; lead is chiefly worked in Flintshire. Excellent slate is found in various parts of Caernarvonshire, and worked to a great extent, especially on Lord Penrhyn's estate. Marble is worked in Anglesea, and limestone, freestone, and other stones and minerals abound in different places.

1. Property.

Estates from thirty shillings to 30,000. The effect of the custom of gavelkind, which obtained all over Wales, was a too minute division of property. Equality and poverty went hand in hand. But when that custom was abolished, and succession permitted, an accumulation of property was the necessary consequence, which became very prevalent in the two last centuries: and having arrived at its maximum early in the eighteenth century, it has, since that period, shown some instances of retrogradation: but subdivision and accumulation of estates will naturally fluctuate. There are no petty lairds or tackmen, as in Scotland and Ireland.

Gentlemen of moderate income, and residing in the country, transact the affairs of their own estates. Those of greater property commit the whole care of rents, repairs, and contracts of sale or purchase, to the management of agents; who, in general, are persons well qualified for the undertaking, brought up solely to the business, and make it a point of honor and integrity to do justice to the landlord, and a point of conscience not to oppress the tenant. Some of the lawyer agents, having by their own indolence and rapacity destroyed the very use of litigation in the people, necessarily diminished the number of their successors.

Only two copyhold tenements have been noticed in the whole district. All the other estates are held either mediately or immediately in copies of the King, by a kind of mixed tenure, be-

tween the feudal and allodial, going under the common appellation of freehold.

2. Buildings.

Some fine castles, as Fowry, Penrhyn, and Chirk. Of stucco, about seven in ten are in a very wretched state; good new ones in Anglesea, and Caernarvonshire, Flintshire, and Merionethshire.

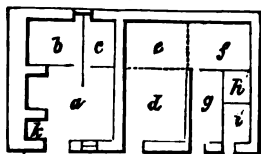
Cottages: in these and other counties are truly the habitations of wretchedness. One smoky earth, for it should not be styled a kitchen; and one damp litter-cell, for it cannot be called a bed-room, are frequently all the space allotted to a laborer, his wife, and four or five children. The consequences are obvious; filth, disease, and, frequently, premature death; and they would be more obvious, had not these evils an almost unobdurable vigor of constitution to encounter. Three-fourths of the victims of the putrid fever, perish in the mephitic air of these dwellings. However, in some parts, especially near lime works, mines, collieries, &c. the example of one neat cottage is followed by others. Here, their dwellings are frequently well-washed; their children are industrious in collecting road manure, which is preserved within circles of stone stones for the use of their gardens. These minutiae, though trifling, are worthy of record, as they are descriptive of their general character.

Some exceptions in different places, and especially on Lord Penrhyn's estate. The reporter gives an excellent plan of a

cottages for a cottage farm, and also plans of farms of different sizes, adapted to such cottages.

The cottage farm house (g. 808.) contains a kitchen (a), bed-

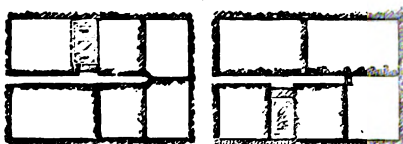
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room or parlor (b), pantry (c), barn-floor (d), two bays (e and f), cowhouse (g), calving place and calf house (h), pigsty (i), and stairs (k) to garret and bedrooms.

(One cottage farm for the same house, and nine acres of land, contains seven small enclosures (g. 809 a.), including the garden. One for six acres, contains six enclosures (b) including the garden.

a 809



3. Occupation.

Largest farm of cultivable land about 600 acres, on the mountains 1000 acres and upwards, at one shilling, or one shilling and sixpence per acre: size on the increase, and admitted to be favorable to wealth by the reporter, who adds "yet that wealth should be valued, not in proportion to its national aggregate, or quantity in the abstract, but as it is widely and generally diffused. An analogy exists between monopoly in all its forms, and a macrocephalous constitution, which never can possess the energy of a body symmetrically proportionate.

Farmers, properly so called, are, as we may naturally expect them to be, rather too tenacious of old customs. It is, however, illiberal to charge them with obstinacy, in delaying the adoption of pretended improvements; for, as it is not all gold that glitters, neither is one half of the patent implements, and machines, or one-tenth of the writings of visionary theorists, better than lumber and trash; for which the farmer should not throw away his hard-earned money, before they are put to the test of experience, by those who have opinion enough to hear disappointment; and who, from the advantage of superior education, may be better qualified to form a judgment of the probable effects. Show the farmers their true interest, and, in general, their minds are as open to conviction, and as susceptible to reason, as any other class of men whatever.

Leases out of repute. It cannot be denied that leases have done good in Scotland. We are, therefore, driven to the necessity of supposing, that the Scotch and Welsh tenantry are very different kinds of beings. The circumstance that renders the Welsh leases ineffectual, is the want of capital; and what enhances the evil of this want is, the ignorance of many farmers in the right application of what small capital they have. By tilling too many acres, they, as well as the public, suffer loss in every acre. Many a farmer, who has means barely sufficient to manage a farm of 50*l.* a year, tolerably well, thinks a farm under 100*l.* or 150*l.* beneath his notice; and granting a lease to such a tenant, who has not one-fourth of the capital requisite to carry on improvements, would be premature.

Lord Penrhyn executed draining, fences, roads, and all improvements requested by his tenants, and approved of by his agents, at five pounds per cent. on their amount added to the rent.

4. Implements.

The original Welsh plough, a clumsy wooden fabric, still in use in Caernarvonshire, and a few places in other counties; about 1660, Lammam's variety of the Scotchman introduced, and now common; Scotch plough now generally known and approved; and the other improved implements tried by the amateurs.

5. Arable Land.

"That farmers convert too much of the lands which were formerly in tillage, into pasture, is but a groundless cause of alarm. Farmers should, and always will, consult their own interests; and whether the conversion of their lands into tillage or into pasture be, for the moment profitable to themselves, the same will eventually be found most beneficial also to the public."

The corn raised in North Wales not equal to its consumption; fallows general and defended as necessary. In Anglesea, a rotation of five white crops in succession; most of them barely return the expenses; very little wheat, to a half-inch width, a crop oats, and next barley. Scarcely any flax or hemp grown; potatoes beginning to become a general crop. On the whole, the management of arable land wretched, excepting by the amateurs or proprietors.

6. Grass.

Land well adapted for tillage; is commonly left too long in pasture; by which neglect it becomes moor, and in some instances covered with ant-hills. It has been said of some meadow-lands in Wales, that a man may mow in them all day, and carry home his day's work at night. This may appear hyperbolic; but it is so far true, that in some meadows the root of the sward never disappears; and a mower may be certain of having followed the same line, to a half-inch width, for twenty or any number of years back. In such meadows, the trouble of raking the hay together is the great work of harvest. In the eastern parts of the counties of Denbigh, Flint, and Montgomery, consisting of the most fertile vales, the principal

object of the farmers is to convert their hay and grass, as much as possible, into butter and cheese.

In the hilly parts of the above-named counties, and in Anglesea, Caernarvon, and Merioneth, their peculiar province is to rear cattle, to be sold lean to the graziers of other districts. There are but a few acres of land that will sustain cattle. The vales of the Severn and Vyrnwy in Monmouthshire, the banks of the Dee in Flintshire, and the vale of the Clwyd in Denbighshire, are the principal places where the pastures afford sufficient nutriment for that purpose.

7. Gardens.

Much wanted for the cottages, especially in Caernarvon and Merionethshire. Too many poor cottagers have not as much as a look or a potatoe, except what they either beg or buy. In the greater part of the district, the planting of orchards would be thought a very wrong application of the soil. On the borders of England are some orchards; and in plentiful years, a few farmers make either cider or perry for their own beverage.

8. Woods.

Have been abundant in former times, especially in Anglesea; now very scarce there and in Caernarvonshire; more in Denbighshire, especially round Chirk Castle, Wynnast, Erthing, Vale of Clwyd, &c. Extensive young plantations made in these counties, especially at Wynnast and Lord Penrhyn's. A great deal of Scotch timber, wood lands, and plantations in Montgomeryshire, which will long be the best wooded county in North Wales. Proprietors planting upon a large scale, and not raising trees from seed in their own nurseries, formerly used to procure seedlings of larch, fir, and pines, &c. from Scotland; but owing to their heating in close bundles, and otherwise damaging upon the road, not above one-fourth, and frequently not above one-eighth, the number, could be expected to grow. They are now more given to encourage nurserymen at home, and nurserymen are accordingly established in different parts of the district. "One annual year-old seedlings of all sorts of forest trees, nearly as cheap as in Scotland, reckoning carriage, and one thousand worth two of theirs." This is true when the tenderness of seedlings, distance of carriage, and length of time, are considered. Williams, and other nurserymen, ensure trees of their own growth and planting for a number of years."

9. Improvements.

A marsh of 3000 acres in the southern corner of the island of Anglesea attempted to be embanked in 1790. The scheme was brought forward from both sides at the same time, and was intended to be joined in the middle of the marsh, where the force of the tide was greatest: when within about twenty rods of a complete junction, owing to some of the proprietors withholding their dividing, the work was deserted, after expending nearly 12,000*l.* and when a few pounds more would have completed the whole, as the materials were already carried on the spot. On the 23d of January, 1796, an uncommonly high tide added twenty rods more to the breach, in which state it now lies. The bank was made of three fagots, bound with double cordage, covered with sand, then with soda, and on the sea-side with a stone pavement, eighteen inches deep at the top, and diminishing to nine inches at the bottom. It was fifty-one yards wide at the base, four yards at the summit, and five yards high; the slope of the sea-side to that of the land-side, as seven to four.

The embankment and improvement of Traeth-Mawr and Traeth-Brychan sands, between Caernarvon and Merionethshire, have been above 170 years in contemplation, and never yet performed. In 1625, Sir John Wynne, of Gwydir, intended to have brought over Sir Hugh Middleton, the celebrated engineer, to undertake the work; but no materials were wasted, save ink and paper. In the year 1719, some Dutch adventurers made a proposal to the proprietors, but to no effect. In 1770, the late Bell Lloyd, Esq., who was always active in works of public utility, and others, brought the subject afresh under consideration; at the same time proposing a nearer road from London to Dublin, across the Traeth-Mawr sands, when embarked. Golborne, the engineer, was sent down by the Duke of Lancaster, and two estimates were made. The late Dr. Worthington was peculiarly active in forwarding the work. He had gone so far as to procure subscriptions to the amount of 29,000*l.* and upwards, when the whole scheme was frustrated by the mean spirit and refractoriness of some neighboring proprietors.

In 1809, W. A. Madocks, Esq. M. P. having a considerable estate on the Caernarvonshire side, and having there embarked Penmorfa marsh with great profit (g. 810 a) and the village of Tremadoc (b), commenced embanking the sands of Traeth-Mawr (c), by carrying off from both shores an immense bank (d) of stony materials deposited and left to find their own slope by the washing of the tides. The two banks were within less than a furlong of being joined in the middle; but owing to the force of the tides, and the embankments of the very spirited proprietor, it was never completed.

The River Dee Company, established by Act of Parliament in 1740; by several embankments made in the years 1754, 1765, 1769, and 1790, on the river Dee, in Flintshire, to keep out the tide and land-floods, they have been enabled to gain 3100 acres, which are now covered with good crops of corn, of flax, and of artificial grasses; and the whole redeemed waste is incorporated into a township, bearing the very appropriate name of Sealand.

"In various parts of the coast of Anglesea, and the other maritime counties of North Wales, there is still much to be done by embanking. Caernarvonshire has been eminently fortunate in the acquisition of W. A. Madocks among its leading improvers. Indeed, his improvements are of such magnitude and variety, designed with such taste, and executed with such facility, that a minute report of them would appear, to those who have personally visited the place, more like the reveries of romance, than the narrative of genuine description. In harbours, on banks, canals, buildings, roads, plantations, and rural and commercial improvements in general, nothing less than a *Tre Madoc* guide pamphlet can do justice to the founder."

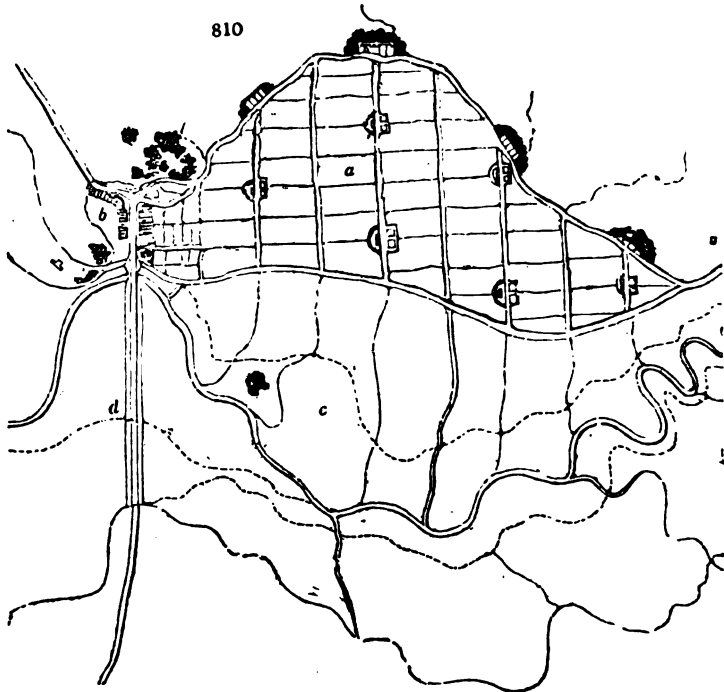
10. Live Stock.

Cattle and copper the staple exports of Anglesea. When numerous herds are bought in the island for the English markets, they are compelled to swim in droves across the straits of

the Menai; and although numbers of the weaker sort are sometimes swept down by the force of the current for some miles, yet losses seldom or never happen. A chain bridge is now erecting across this strait.

The characteristics of a choice Anglemoor, must agree in most points with those of a Roman one, as described by Columella: coal-black color, with white appendages; remarkably broad ribs; high and wide hips; deep chest; large dewlap; flat

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face; and long horns, turning upwards. Bakewell thought, that in some points they were nearer his idea of perfection in shape, than any other he ever saw; his own improved breed excepted. Some farmers aspiring at a select stock, by having their he-calves get under their dams, their horns become of a yellow color, longer, and finer than common; and, upon the whole, nearer the present idea of symmetry. The average weight of their quarters, when fat, at three or four years old, is from eight to eleven score pounds.

The promontory of Llyn and Evionydd, in Caernarvonshire, having the same kind of undulated surface, though not altogether so good a soil as Anglesea, has likewise a breed of cattle similar in several of their characteristics.

The cattle in the remaining part of Caernarvonshire, and in the whole of the county of Merionydd, some few select stocks excepted, seem to be diminutives of the above breeds of Anglesea, Llyn, and Evionydd; having nothing to recommend them, save their extreme hardiness, and consequent cheapness of rearing. The highlands of the counties of Denbigh and Montgomery abound with the same puny race. In the vales, and in the county of Flint, the cattle are of a superior kind, larger, and of all varieties of colors. The natives of the coast from Abergele to Holywell, and thence along the Dee towards Cheshire, are reared very quick feeders.

Neither good butter nor cheese are made in North Wales by ordinary farmers.

Sheep. The largest of the native breeds, is that of Anglesea; they have white legs and faces, and are generally without horns.

The second kind of sheep in North Wales, is that peculiar to the mountains. They have generally white faces and legs; some have horns, and others none. The smaller sort of them weigh from seven to nine pounds per quarter; and give wool from three quarter of a pound, to one pound and a half.

The third kind is peculiar to the Kerry hills in Montgomeryshire; being, perhaps, the only species in North Wales, which produce perfect wool: that of every other Welsh breed being more or less mixed with coarse long hairs, called by the manufacturers kemps, making the articles in which they appear, of much less value. The characteristics of this breed are, large woolly cheeks, white lumpy foreheads, white legs are covered with wool; no horns, and a broad beaver-like tail. They are very hardy, and comparatively tame; being not so much disposed to ramble as most other wild sheep. In shape, however, they are far short of compact symmetry; and were this defect improved by the care and attention of the farmer, the breed would be worthy of being universally adopted throughout the principality. They weigh, when fat, from ten to fourteen pounds per quarter. The average of wool, including the whole flock, is ten stone, of fifteen pounds each, from every 100 sheep.

The fourth kind is the black faced, and fine woolled sheep, bred on the Long Mountain, near Welsh Pool; and on other

hills, on the borders of England, in a line from thence to Wrexham.

The flavor of the mutton of the sheep feeding upon the Llanymynech and Porthyrwan lime-rocks, is reckoned very delicious, by the nice palated pupils of the epicurean school; and their wool is as fine as any in England; that of the Ryeland breed, perhaps, excepted. A person in travelling through the country, may observe several other kinds of sheep; being crosses from some or other of the above four distinct breeds; but they are in general the offspring of chance and instinct, without being directed by any choice or system.

The Merinos with their different crosses; the Leicester, Downs, and others, bred by amateurs.

Horses. In Anglesea, for want of fencibles, the horses, as well as the sheep, are commonly fettered. Were coats of the best shaped breed in existence, thus fettered as soon as they are weaned from their dams, and the practice used from generation to generation, their natural gait and shape must necessarily be changed, at length, into awkwardness and deformity. Few English stallions have as yet been introduced into the island; and those that have, do not appear to have done much towards improving the native breed.

In the county of Merionydd, and the hilly parts of Montgomeryshire, great numbers of ponies, commonly called merlins, are reared. They are exceedingly hardy, having, during winter as well as summer, only the range of the hills; from whence they are never brought down until they are three years old, and fit for sale. What has tended to, and will in time destroy the shape and good qualities of this hardy race, is, that in the propagation of their species they are left entirely to chance and instinct.

They are driven from the hills to fairs, like flocks of wild sheep; and the place of sale exhibits, in some degree, an amphitheatre, where manhood and ponyhood strive for the victory. When a champion has fixed upon his choice at a distance, the wrestler, being generally the seller's servant, rushes into the midst of the herd, and seizes the selected animal; which, never before touched by human hand, struggles with all its might to extricate itself; and in some particular situations, both have tumbled topsyturvy from the summit of a steep hill down into a river beneath; the belpied still continuing his grasp, and the quadruped disdaining tamely to submit.

Another breed, somewhat larger than these, and probably raised by a series of crossing between the English and the natives, are hardy, handsome, and exceedingly active. Some of them are too small for the team; but for the road, under moderate weight, they have no rivals. "They will ascend and descend our mountainous staircases" with the greatest agility; and without giving their riders, who have more fool-hardiness than humanity, the trouble of alighting. The larger kind of them is exceedingly well adapted for the team, on small or steep mountainous farms; where the great strength and sluggishness of the heavy kind of horses would be egregiously misapplied.

The value of Montgomeryshire have long been noted for an excellent breed. Some attribute this superiority to a stud of horses kept by Queen Elizabeth, at Park, near Caer Sŵn, in the Severn vale; and to others brought into this part of the country from Spain, by Robert, Earl of Shrewsbury.

Gentlemen in most parts of the district, and farmers in the vales of the three counties bordering on England, have for some time furnished themselves with excellent draught horses, both for the coach and the wagon; which, when the markets are open, are sold in great numbers. They are generally either black or bay; strong, active, well made, and measure from fifteen to sixteen hands.

A custom very injurious to the growth, strength, and soundness of horses, prevails over the greatest part of the six counties, that is, working them too young; when their bones have not attained firmness from their cartilaginous state, nor their power of elasticity, contraction, and extension, which is necessary to endure exertion and labor. Instances have, however, occurred, of horses being worked from two to twenty years old, without any apparent detriment, saving a diminution of their natural size.

"The predilection which farmers manifest in favor of horse manure, may, in time, reduce the nation to the dilemma of enacting a law to repeal the *Mosaic*, and enjoin the flesh eating."

Tender furze, bruised with mallets, or ground in mills erected for the purpose, was formerly a great article of fodder in the counties of Anglesea and Caernarvon. Farmers were then accustomed to sow furze for their horses; and sometimes to let the crop at a certain price per acre, which was frequently found to pay better than a crop of wheat; but Ceres at length seems to have grown ashamed of such husbandry; and the lands are in general converted to bear more useful crops.

Hogs. The original Welsh breed had small ears, which, probably, by a cross with the Berkshire produced the couch-eared hog, which is now lately general through the country. They are slow feeders, and the rearing of them is now upon the decline, and giving place to that of more improved breeds, especially B-rhine.

Bees. "The ancient Welsh held these industrious insects in great veneration, and held them in esteem as Patrons of order and industry." (*Welsh's Laws*, p. 254.) For this reason their priests taught that the chanting of mass was not acceptable to the Deity, unless the lighted tapers were made of their wax. Out of their dulcified stores they brewed their national liquor, me-the-gin, or the medicinal beverage.

When the country was in a state of continual wilderness, almost every hollow oak was an apiary. Their nests on the wastes were the property of the lords of the soil, and rented by some of their vassals. On freehold lands they were claimed by the respective proprietors. The discoverer of a swarm was entitled by law to a reward of one penny, if they were domesticated bees, and one penny and a dinner, or in lieu of these the whole of the wax, if they were of the wild race. Whoever cut a tree upon another person's property, in order to get at the nest of bees, was to be amerced the full value of both tree and bees. The respective prices of different swarms were ascertained by law.

Early swarms were reckoned of great value, but the first of the year; such as swarmed after that day were not valued above four pence until the following May.

In comparison with the prices of other articles, at the time the Welsh laws were framed, bees seem to have been very dear, and consequently scarce; but the price set upon them by law was much above the true price in commerce, and the bee was held in great esteem by the veneration they were held.

7045. SOUTH WALES. Six counties, and some and mountainous surface; generally of a salubrious more temperate than the air of North Wales. The soil argillaceous red loam, or calcareous, but generally rich in the vales and declivities. Of minerals deal of lead.

1. Property and Buildings.

As in North Wales. In South Wales in general the custom of white washing cottages is prevalent. In Glamorganshire, not only the inside and outside of houses, but barns and stables also, walls of yards, and the stone and brick of quickest hedges, and even solitary stones of large dimensions, house blocks, &c. near the houses, are white washed. This practice is traced to a very remote antiquity. Diodorus Siculus is quoted as mentioning the British custom of white-washing houses. Gentlemen's seats are distinguishable from cottages, not only by their size and plans, but also by their colors. In Glamorganshire, gentlemen mix ochre with lime, to make their seats of Isabella yellow. In the north of Pembrokeshire, &c. the taste is reversed; the cottages are of a very dirty color, and gentlemen's houses are white washed; the maxim is—not to be what the lower classes are, not to coincide with the vulgar in their practices.

2. Occupation.

Farms of all sizes; two mountain farms of 1400 acres each; general run from 50 to 100 acres, average of the district between fifty and sixty acres. In the uplands, rearing of stock is the main object, without neglecting the produce of the dairy; whilst their find convenience, the lowlands, or moist loams, scanty and precarious tillage, in the lowlands, or moist loams, especially in the more humid climate of the western counties, grazing is considered, and generally recommended, as most profitable.

Upon an average of the whole, the district may be said to be occupied in that kind of system called mixed husbandry; breeding, dairying, and tillage; varying in the proportion of each, in different places according to the impiousness of existing circumstances, which will be hereafter more fully explained.

Farmers may be classed, as proprietors farming a part of their own estates, small proprietors or yeomen, farmers of the old school, and book farmers.

"Book farmers, the serialists of Marshall, are those who know agriculture only by reading about it. They rise in the *ne plus ultra*; as they generally grow tired before they are much acquainted with practice. The practice of the country they come to reside in is all wrong, and the inhabitants all savages. They bring ploughs and ploughmen generally from a distance; and when the masters retire, the ploughmen return, and the ploughs are laid aside. They hold the farmers of the old

in by the legislature; and intended to deter the subject from offending against the statutes made to preserve them. As a confirmation of this opinion, every thing that belonged to bees had its value exaggerated in law: even a bee-hive was appraised at two shillings, when a new plough without iron was valued only at two-pence; a cow forty-eight pence, a yearling calf fourteen pence, and a suckling calf one penny.

The sacred esteem in which bees were held, at length declining, aparies were gradually reduced to their present fiveness of number. However, several persons still execrate the profane act of disposing of their bees for money; but will, nevertheless, let them out for one half share of the honey and wax, when they are killed annually in autumn; and the whole live stock to be parted equally between them at the end of the fourth year."

In Wales, as in Poland, when spirits and beer became more common, the use of methuegin declined, and bees were neglected. Hence, it may be inferred, that the veneration in which this insect was held in these and other countries, was owing to its affording almost the only, and, at all events, the cheapest and most powerful means of indulging in that which man, in all ages and countries has considered the *summum bonum* of enjoyment,--intoxication: an enjoyment which, whether with Noah, it be procured legitimately from that "transcendent liquor," wine; with the American Indians, from elixir; or the Turks from opium, has this advantage over all others, that it is more immediate, more intense; that it is within the reach of every one; that every one can have it to the full; and that for the enjoying which no man is envied by his neighbor.

11. Political Economy.

Great improvements have been made in the roads and bridges of late years, especially by Lord Penrhyn, Wynn, Madocks, and Government, under the direction of Telford. Previous to the year 1785, the annual exports of slates from Lord Penrhyn's quarries at Dolwen, did not exceed 1000 tons, which, owing to the ruggedness of the road, were conveyed from the quarries to the port, a distance of six miles, in panniers on horses' backs. His Lordship formed a new road, which gave immediate employ to about 120 broad-wheeled carts and wagons; and from the quarries he extended the road nine miles further to Capel Cargi, through Nant-y-franco, and the romantic interior of the country. In so doing, the whole tract being his property. The increase of the slate trade caused his Lordship afterwards to have an iron railway, the length of six miles, from Dolwen quarries to Port Penrhyn.

The chain bridge now erecting across the Menai by Telford will, when completed, be one of the most extraordinary works of the kind in existence.

Of canals there are several, with stupendous aqueducts and bridges. The aqueduct of the Elmsmere canal, thrown over the Dee, is the first in Europe. It was opened in November 1805.

Manufactures chiefly blue cloth, blankets, flannels, and Welsh plains or cottons. The best Welsh flannels manufactured in Montgomeryshire. Welsh cottons made since the time of James the First, have the warp of fleece wool, and the weft a mixture of one-third or one-half of Welsh wool. Knitting stockings and caps very general among the farmers of cottages and small farms. Argillaceous schistus is converted into slates for the roofing of houses and other purposes, to a very great amount within this district.

Erythrolous acid extracted from brushwood, at Hope in Flintshire, for the use of cotton dyers. A number of other manufactures to a moderate extent. Several agricultural societies.

islets, comprising together 2,470,400 acres of hilly climate; cold on the mountains; but on the whole more temperate than the air of North Wales. The soil argillaceous red loam, or calcareous, but generally rich in the vales and declivities. Of minerals there is abundance of iron, coal, lime, and a good

school, as they call them, in sovereign contempt, who, in return, deride their puerilities, and, in their own quaint phrase, set their ineffectual attempts to establish a system of improved agriculture, *a flash in the pan*. They considerable good in the vicinity they dwell in, by employing laborers; and by their imported implements they open the eyes of mechanics. Most of the harm they do, is to themselves. They injure others mostly by an exorbitant advance in the wages of servants, especially of such as pretend to be farm-gailliffs. They give double the wages that the old established farmers in the best cultivated counties, Salop or Hereford, &c., will give. They have generally very exalted notions of the value of land, and the powers of soil. They read of the high returns of crops in England or elsewhere, and calculate there upon the value of land in the hands of Wales; which, as they have farms to let, makes it extremely difficult to deal with them. Their opinion of manure depends on the book they have read last. If Jethro Tull is their favorite author, soil requires nothing but ploughing and stirring. With *A. time is every thing*; with his brother B. only a few miles distant, and on the same kind of soil, *time is nothing*.

3. Implements.

The Welsh plough is in common use; and perhaps a more awkward, unmeaning tool, is not to be found in any civilized country. It is not calculated to cut a furrow, but to tear it open by main force. The share is like a large wedge; the coulter comes before the point of the share sometimes, and sometimes stands above it: the earth-board is a thing never thought of, but a stick (a hedge-stake or any thing) is fastened from the right side of the heel of the share, and extends to the hind part of the plough; this is intended to turn the furrow, which it sometimes performs, sometimes not, so that a field ploughed with this machine, looks as if a drove of swine had been mowing it.

The Rotherham and other improved ploughs are in use among the proprietor and book farmers, and the Scotch plough is coming into very general use. A gentleman, a naval officer, in Cardiganshire, introduced the light Rotherham, and insisted on his ploughmen, as using them. As usual, the old ones were new ploughs were dismissed the service, and the new ones were brought into the field; one day, in a rage, he committed the old to the flames, and set the new ploughs a-going. Afterwards taking a ride to cool himself, and returning, he found the new

ploughs in the ditch, and old ploughs borrowed from the neighbors at work: the master then thinking it useless to persevere, gave up the contest. "I have," said he, "seen various kinds of human beings, in different parts of the globe, from latitude ten to latitude fifty-four, but none so obstinately bent on old practices as the Welsh."

H. Lewis, Esq., of Gally y Gog near Caernarthen, being equally unsuccessful in effecting a revolution at once, tried the plan of altering the old ploughs in a slight degree, and hopes, by one alteration after another, at length to transform them into Rotherham ploughs "unaware to his sturdy ploughmen."

Waggons and clumsy two and three horse carts are in general use; almost every farmer of forty pounds a year rent has a wagon. Single horse carts gain ground but slowly. They were introduced into the vale of Towy, several years ago, by Lord Robert Seymour; into Cardiganshire, by Thomas Jones, Esq.; and into Brecknockshire, by Sir Edward Hamilton.

A *key rake*, with the head forming unequal angles with the handles, is in use in Glamorganshire, the only advantage of which is said to be that of not obliging the rake to step his foot backward at every reach.

4. Arable Land.

In general wretchedly managed, especially the fallows. The reporter proposes to send farmers' sons to improved districts to serve apprenticeship, as better than examples set by strangers, which have been tried without success. A patriotic land proprietor brought what were considered as enlightened farmers from Scotland into South Wales; but as Hassall very judiciously observes, "New practices in husbandry will be most likely to succeed through the medium of the natives of the country. They have an unconquerable dislike to every thing introduced by strangers; and not without some reason, as most of the people who have come into this country from the English counties, and commenced farmers, were in bad circumstances at the outset, and therefore have not succeeded in their undertakings; and the natives, eager to reprobate any thing new, readily attributed their failure to defective practice, rather than to the real cause, want of capital. This observation will be found to be generally true in every country. Few persons in good circumstances can be tempted to migrate; whilst others of a different description are frequently under the necessity of doing it; and, generally, it can only tend to hasten their total failure. Then the teaching of the natives, as recommended above, would have a much superior effect in establishing the doctrines of the new schools, than the introduction of any strangers into the country."

The sand banks, checking the progress of the tides into a flat tract in Glamorganshire, in order to render them more firm, they are matted with the roots of the sea mat-weed (*Arundo arenaria*). The hon. T. Mansell Talbot, binds each of his tenants, who rents land in the adjoining marshes, to give yearly the labor of a day or more, in proportion to his holding, as a kind of statute duty, for the planting of this reed; and experience has proved its good effects.

5. Grass.

"By a correct map of the rivers of a district, with a scale of their fall in a given number of furlongs or miles, and of the mountains from which they flow, and those distinguished by kinds of 'quality colors,' a geologist might give a fair estimate of the quality of the soils and grasses of the respective valleys intersecting that district, though anomalies frequently form exceptions in valleys as well as on sideland places."

The practice of fogging pastures, almost peculiar to Cardiganshire, has been already described (5255). The reporter saw a piece that had been fogged successfully for sixteen years, and according to the tenant's information, was improving annually. When land has been mowed too long, one year's fogging is supposed to recover it. Mossy pastures are benefitted by it. It replenishes the soil with seeds, that by this means are suffered to ripen and shed on the ground; and it is said that two years fogging will recover lands, let them be ever so run out by tillage or mowing. Cattle used to fog, will quit hay that may be given them, and clear away the snow with their feet to get at the fog. The fields proper to be kept in fog, must be of a dry, sound, and close soil; the argillaceous rather than the siliceous earths should prevail in it; but not so much as to be over retentive.

The late Thomas Jones, Esq., of Havod, observes, "Fogging is getting out of repute: it must have originated in chance, and want of a summer stock of cattle."

Clover is grown in some few places for seed, which is separated from the heads in a common corn mill, the upper millstone being replaced for a time with a square piece of oak furnished with eight wings studded with nails on their upper surfaces. These spokes, by their rapid motion, soon beat out the seed.

6. Gardens.

On the maritime coast of South Wales generally very productive: those of the cottagers better attended to than in other parts of the district; a pleasing mixture of flowers, small fruits, and vegetables.

Orchards in Radnorshire and Brecknockshire thrive well in the valleys, but more especially in the vales of Wye and Usk. Not much cider made, excepting on the Wye.

7. Woods and Plantations.

"It appears from old deeds, that estates were formerly sold at an inferior price, in consequence of their being crowded with timber. Times are now changed."

There are a great many oak woods and coppices in hilly

parts of the district, and many thriving plantations in every part of it. It is calculated that at an average six millions of trees are annually planted; if this be the fact, it is probable nine tenths of them either die or are doomed to come to nothing, for at this rate, in fifty years, there would be 150 trees for every acre in South Wales, which, added to the old wood and copse, would give 300 trees, or enough to render the country one entire forest.

8. Improvements.

Numerous inclosures have been made, and fencing, draining, and, in some cases, watering practised as in other countries. There are nearly 15,000 acres of fen and sands on the coast of Cardiganshire, which are considered highly improvable, and which it has been at different times in contemplation to embank. Of one of the worst parts of this land, the late agriculturist Dr. Anderson, who was much with Johnes of Havod, said he could make it carry wheat in five years.

9. Live Stock.

From ancient records it appears that the colors of Welsh cattle were white, with red ears, like the wild reds at Chillingham (6130.); they appear to have been in a wild state so late as the time of King John. The present stock are of four kinds: the coal-blacks of Pembrokeshire; the brownish blacks, or dark browns, of Glamorgan; the black runts of Cardiganshire, Caermarthenshire, and the western parts of the counties of Brecon and Radnor; introduced breeds, from Herefordshire and Shropshire, into the eastern and more fertile parts of Brecon and Radnor.

Cows are kept for breeding, and making butter and skim-milk cheese. Jones has proved, that at Havod, cheese may be made at will, so nearly resembling Parmesan, Stilton, Gloucester, or Cheshire, that the difference cannot be perceived by good judges; and that the whole mystery consists in various modes of producing it from the milk.

The sheep of South Wales are of four kinds: mountaineers, Glamorgan sheep, Glamorgan Down sheep, and crossed and intermixed breeds.

Mountaineers occupy the hills in the several counties of the district.

The Glamorgan vale sheep, is the only breed in Wales, not introduced within memory of man, that produces combing wool.

The Glamorgan Down sheep is a beautiful and excellent small breed. Feeding upon the oldest and sweetest pastures of the limestone tract, their mutton is superior in quality to most, and inferior to none; their wool is of the short clothing kind, and fine. They are generally polled.

Wild cross and intermixed breeds many experiments have been tried within the district, and most of them confessedly without the expected success. Particular breeds of sheep have their peculiar diseases, which continue in their constitution, wherever they are removed. The limestone tract may be considered as the healthiest for sheep within the district, but even there the imported modern breeds have brought with them the scab, the foot-root, the gorgies, maggots, and a long train of diseases never heard of before in Wales: these are to be ranked among the profits of commerce.

Horses. The small Welsh merlins or palfreys are now in many parts nearly extinct: they are a pigny race, and may now and then be found in the hilly valleys of the interior of the district. There were formerly a very good breed of hardy strong ponies, fit for riding and walking upon the farm, being a cross between a good-sized horse and the small merlins; and very useful they were; but the breed has almost been totally neglected and lost; for they cross now too much with the large and sluggish cart horses.

10. Political Economy.

Reads as in North Wales, or worse. Road ploughs in use; a characteristic both of their state and of the nature of the materials. Good limestone however in the coal districts, and especially in Glamorganshire. Manufactures of woollen in many places; and owing to the abundance of oak copes, many hides tanned. Potteries on a large scale at Swansea, Cardiff, and other places. Extensive iron and coal works, lime works, and a slate quarry in Cardiganshire, &c.

The *Lias limestone*, (lime and iron combined, the stone of a bluish or greyish color,) though found in many parts of England, is no where so valuable as that at Aberthaw. When burnt into lime, it is of a buff color, the characteristic, according to the engineer, Smeaton, of all limes setting in water. Lias limestone in all parts has a peculiarity of stratification and exterior character, so that a rock of it may be known at a distance. The strata are of various thickness, from a few inches to a few feet; and those commonly separated by a few inches thickness of marley clay. The ferruginous ingredient seems to be concentrated in the interior part of each stratum; the outer sides thereof being more porous, and of a paler color. In inland places the strata are burnt altogether, the argillaceous as well as the ferruginous calcite. Here, at Aberthaw, or other maritime coasts, the strata tumbled down, within reach of the tides, are broken and rolled about, until they are reduced to rounded pebbles or nodules, from a few ounces to many pounds weight; and these consist only of the nucleus or kernel part, the more useless shell being torn off by the abrasion of the furious tides. These rounded lias pebbles are driven on shore in inexhaustible quantities.

Of agricultural societies there are several: that of Brecon, instituted in 1755, the earliest in Britain after that of Edinburgh.

SECT. III. Agricultural Survey of Scotland.

7046. The surface of this country is estimated at 18,944,000 acres, in three natural divisions. The first lies north of the chain of Highland lakes, which stretches from Murray to Mull, and consists of little else than dreary mountains and some moors; the second, or middle division, extends from this chain of lakes to the rivers Forth and Clyde; it is mountainous, but cultivated in the valleys, and on the eastern shore to a considerable extent; the remaining division is covered by hills with some mountains, but every where

cultivated or improvable, and highly favorable for most branches of agriculture. Though Scotland, as elsewhere observed (771.), was far behind England in cultivation, till the middle of the last century; it has now greatly outstripped that country, especially in arable husbandry: a proof that this is the general opinion of enlightened men may be deduced from the notices just given of the English and Welsh counties, in which it appears that the improvements introduced or attempted to be introduced on arable land, are with few exceptions the implements and practices of Scotland. In the management of meadows or old pasture, Scotland cannot be conspicuous; as the climate is not naturally calculated for that kind of husbandry. The winters are too long and severe, and the surface too irregular. In regard to live stock, the palm of improvement is undoubtedly borne away by England; but though there is not that enthusiasm in Scotland, nor such large prices given for capital specimens, it may be safely asserted that breeding and feeding are conducted as systematically and successfully there as in England. We shall glance at the different counties in the order of their proximity, beginning with that containing the capital. It may be sufficient to mention here that leases are universal in Scotland, most generally for nineteen years, often for twenty-one, sometimes for fourteen, but seldom for a shorter period. The poor are supported by voluntary contributions at the church doors, though an assessment on property, half paid by the proprietors, and half by the tenants, may be made if necessary, which is very seldom the case. Tithes were commuted for their value in land, and land's produce at an early period. Every parish has a schoolmaster, who is paid jointly by the proprietors and the farmers. There is a professorship of agriculture in the Edinburgh University, ably filled by Dr. Coventry, a man of whom it may be truly said, that he is universally esteemed and beloved.

7047. MIDLOTHIAN. 230,400 acres, one third hilly and inaccessible to the plough, and two thirds in tillage, pasture, or wood. The store sheep farming is practised on the hills, and a mixed agriculture on the low grounds. Green crops and potatoes are extensively cultivated for the Edinburgh market, and most farmers are more indebted to the manure they receive in return, than to the soil, or superior skill; many of them are townsmen, amateurs, and speculative cultivators. The Dalkeith Farmers' Society, one of the most useful that has been formed, and which still exists, belongs to this county; and in it also was founded the British Wool Society, now extinct. (*Robertson's Survey, 1795.*)

1. Geographical State and Circumstances.

Climate free from extreme heats or colds; snow seldom falls on the low parts of the country before December, lies from three to ten weeks. In eight years, the greatest quantity of rain that fell in any year was 56.8 inches, and the least quantity 9.6 inches.

Soil much diversified; lands hanging to the north always the most fertile.

Minerals. A bed of coal extends across the county from S.W. to N.E. from seven to eight miles in breadth; worked for two centuries. Limestone, freestone, granite, and whinstones very abundant. Millstones in the parish of Pennycuik, also marble. Some copper and iron ore, marl and Jasper pebbles on Arthur's seat.

Water. Streams innumerable. Dal (Yek, Gael.) the largest river; few fish from the rivers or streams, but abundance from the frith or sea.

2. Property.

About 540 estates in the county, divided by the reporter into seven classes; first class from two to 30000 or upwards; fifth class 1000. and upwards; sixth class, least properties; seventh class, properties of corporate bodies. Total rental in 1795, 191,000*l.*; Duke of Buccleugh the first proprietor.

3. Buildings.

Many gentlemen's seats, and some fine ruins of castles and religious houses.

A farmer's *maine*, as it is here called, consisted formerly of a set of low buildings, in the form of a square, one side was occupied by the main house, whose habitation was composed of two or three dismal apartments, on an earthen floor, having a low ceiling and a few diminutive lights. On another side stood the barn, in which the roof timbers, from the idea of giving more strength, were built into the wall from the foundation; the wall itself not being more than five feet in height. Opposite to the barn were the stables and the byre, or cow-house. The stables were totally without division, and the horses fed in common; but the next cattle less passive, were each confined to their stables. The cottages occupied the remaining side: in the midst of all lay the dunghill. These buildings were made of turf and stone alternately, or with stone, and clay for mortar; the roof of thatch, or of thatch and straw (turf or straw) intermixed.

Farmhouses now in the first style of commodiousness. An example given of Gorgounbar farm.

Cottages formerly very mean, now much improved.

Farmers very from 100 to 300 acres. Farmers divided into three classes; speculators, converts from other professions; industrious laborers who have acquired some property; and farmers sprung from farmers.

Speculators. "In the immediate vicinity of the town, the greater part of the lands are cultivated, not by actual farmers, but what may be more properly termed speculators in agriculture, people with whom farming is but a secondary object; their chief employment being still what was their original profession, as bakers, brewers, innkeepers, or some other distinct occupation; or in who are otherwise to be found in their town, or in their country houses, then in the midst of their farms, attending to the operations of husbandry. One certain effect, which the speculations of this class produce, is,

that the rent of land is raised above its natural level; for, as they have always some other business to live by, they are enabled to afford more rent; and in fact give more than an actual farmer, whose sole dependence is upon husbandry, is able to pay; while their exertions in agriculture, though in general founded on good principles, commonly end in disappointment to themselves, for want of that unceasing attention which is indispensable to good cultivation, but which their other avocations prevent them from bestowing."

The *moor-land farmers*, as if in conformity to the soil, which has undergone very little melioration, and to the climate, which is naturally severe, seem still to retain a strong cast of the manners of their forefathers, and to live and toil under the same uncomfortable circumstances. Their houses are damp, smoky, and diminutive; their fare simple and limited, and their labors hard and even oppressive. But they have days of relaxation, in which they enjoy themselves at fairs and markets; their marriage festivities are almost boundless, and their funerals are pompous and ostentatious. Religion is maintained in all the austerity of Oliver Cromwell and the covenant.

These farmers are the only ones in a county containing a capital town, who are likely to better their condition. Being inured to the practice of the most rigid economy, they will, when translated to a warmer climate and a more genial soil, very forcibly feel a melioration in their circumstances; and if they have fortitude enough (as the first race of them generally will) to persevere in their original habits of frugality, they may, by dint of mere saving, at the rate, perhaps, of two and a half per cent. yearly on their capital, accumulate, in a life-time, a sum that may be esteemed considerable. But this thriving state will only last during the first generation. Their sons, habituated in time to an easier mode of life, will, amid the great luxury with which they are surrounded, lose their primitive simplicity of manners, and with it the faculty of saving, on which alone their prosperity depends.

4. Implements.

Old Scotch plough, long and heavy, and drawn by four or six horses or oxen, and till about 1765, when Drs. Grieve and Carlisle, clergymen, tried wheel ploughs of a lighter construction, which they had seen in use in Dalkeith Park. Soon afterwards Small's improved plough came into notice.

5. Enclosing.

No commons or common-fields. Hedges first planted about 1760.

6. Arable Land.

When ridges are raised high, they should not be laid south and north, as the crop on the east side of such ridge is commonly found very defective. The same thing holds in the county of Lancaster.

7. Grass.

Very little permanent grass exclusive of the hills and moor lands. Alluvial lands on the banks of streams so liable to immense floods, bringing down soil, &c. that if in grass it would often be much injured; considered therefore more profitable to keep them in corn.

8. Gardens and Orchards.

Henry Prentice, who died about 1785, was the first who cultivated white peas, potatoes, turnips, and sundry other culin-

any plants, on an extensive scale, for the Edinburgh market, about the year 1746. Before that period, the supply was limited to what could be carried in baskets; his cart being the first that appeared with kitchen stuff on the streets. He even raised cucumbers in the fields; but his cart load of these met with so little sale, as not to encourage a repetition. Though he died a peasant on the poor's funds of the Canongate, his name deserves to be noticed with respect, not only as having introduced several of our best vegetables into cultivation, but from his practice as a cultivator, which was spirited and judicious, however little it turned out to his own account.

Strawberries. About 300 acres on the banks of the Esk, and chiefly near Roslin. Crop continued on the same ground without end; but digging down and replanting every fourth year. To change every twenty or thirty years esteemed a better practice. Lands in nursery 300 ac.: Mavor's hothouses at Dalry, and hotwalks of his invention, figured and described. The hothouses heated by steam. Mavor was a Lancashire man, and formerly gardener and steward to the Earl of Aberdeen. He was an excellent gardener and farmer; a man of very general information and highly respected. He was extensively employed as a layer out of gardens and roads, and had the general charge of the gardening and tree department on some gentlemen's estates. The compilation of the Encyclopædia was his pupil, and Mavor, an draftsman for the three years preceding his death, which happened suddenly from apoplexy in 1800.

9. Woods and Plantations.

About 5000 acres so occupied, the greatest part artificial, and planted since 1750. Hedge-row trees never come to anything for want of shelter: but do no good unless twenty rows thick at least.

10. Wastes.

None: but extensive tracts very poor.

11. Improvements.

Draining well understood and extensively practised. Johnston, who wrote an account of Eltkington's mode of draining, a native of the county. Edinburgh and Leith afford about 4000 cubic yards of water annually, which commonly is laid on the lands within five miles of town. Horse dung, however, carried twelve miles or further.

More need for weeding on the arable lands of this county than in those of any other in Scotland; supposed from more town manure being used. The town manure contains the seeds brought in from the country in hay and straw, which are of various kinds; but chiefly wild mustard, wild radish, dock, thistle, poppy, couch grass, &c.

12. Live Stock.

Little attention paid to this department. Galloway and Ayrshire cows preferred, and Clydesdale horses. Some buffaloes of the Mysore variety introduced by Col. Murray: not supposed to turn out well, either as milch cows, or for work, or the butcher, but form a variety in parks. Lord Morton subsequently introduced the quagga (*Equus quagga*) on his park at Morton Hall for the same purpose. Bees a very popular species of live stock with all classes.

13. Rural Economy.

Well supplied with work people from the highlands and Ireland. With the exception of some farm servants in the immediate vicinity of Edinburgh, they are, in general, orderly and moral. Children taught in the parish school; reading at one shilling and four-pence, writing and arithmetic at two shillings and sixpence per quarter; Latin, &c. in proportion. The cottages of ploughmen consist generally of two rooms on the ground floor, with a pigstye, and 100 square yards, or upwards, of garden ground. The furniture consists of two beds, a few chairs or stools, table, chest of drawers, clothes press, &c. and they are all ambitious of having a time-piece, if it were only a cuckoo clock. The whole may be worth from ten to twelve pounds. The Sunday's dress of a young ploughman consists generally of a coat of blue cloth, of five shillings and sixpence the yard; velvet vest, corduroy breeches, white cotton stockings, calf-skin shoes with black silk shoe-knits, shirt with ruffles at the breast, white muslin fringed cravat, and a hat worth eight or ten shillings. The shoe-knits and ruffles are, indeed, rather uncommon, but all the other articles are very much in use. They make a very good appearance, and even pay attention to the fashion. In their food they still live in much the same simple way as their forefathers. Oat-meal forms the basis, or principal part of their sustenance. They have it regularly to breakfast and to supper, made into pottage, which they eat with a small allowance of butter-milk. At dinner they eat it in bread, in addition to their kale, a kind of

soup made of barley broth, intermixed with greens and potatoes. To this they add at times potatoes, and fish of different kinds: seldom wheat bread, and still more rarely butchers' meat. This mode of living, in which, although with no great variety, there is always abundance of food, seems to be very conformable to the natural constitution of the people, as they are found to go through their labour without feeling their senses oppressed, and enjoy a state of health which is very seldom interrupted. At an average, they are not above two days sick in a year.

What is above stated refers chiefly to the condition of farm servants, who are hired by the year, and whose principal concern is about the horses, in the fields, or on the road. There is, however, another class of work people attached to a farm, who are hired by the day, or by the week, and whose employment is usually in jobbing about the barns, the fences, or the water furrows. These are called labourers, and in their circumstances and mode of living there is a considerable difference between them and the others.

Although their wages are in general at a higher rate than the hired servants, yet they make not such a good appearance in their dress, nor are so well seen to in their vicinals, as these. They are generally, as we term it, *from head to heels*, always in want; which seems to arise principally from getting their wages in money, from week to week, which loses them continually to market, providing their daily sustenance; a province left generally to the charge of their wives, who, from this constant running about, get into habits of idleness and want of attention to that good housewifery which is the glory of a decent cottager's wife.

The quantity of coal used by the common labourers is about three fourths of a ton for each soul in the family yearly, by farmers about two tons, and in families of the highest rank about six tons. The price at the pit is from five shillings to seven and sixpence the ton, according to its vicinity to Edinburgh.

Such was the state of things in 1795. Now (1825), at the distance of thirty years they are, doubtless, materially altered. The use of wheaten bread is general; butchers' meat much more common, and cottages more commodious.

14. Political Economy.

Roads so bad previously to 1714, that wheel carriages for the purposes of agriculture were very little used: even till 1760 hay and straw carried to Edinburgh, and other distant places, were taken back the same way in bags. Sledges a good deal employed in those times: they are mentioned in the turnpike act of 1751, but unnoticed in that of 1755, which shows they had been disused; a proof of the extraordinary progress of improvement when once commenced, in consequence of a demand or desire for it. Forced into use by the want of the former. The roads of this county now under one of the M^r. Adam family. Some recent canals and rail-roads. Glass, ropes, and soap the chief manufactures. Iron works at Craigmund, where nails, spades, files, &c. are extensively fabricated. Several paper mills, flour mills, and various minor manufactures and works for local consumption.

15. Obstacles to Improvement.

Illiterality of landlords, game, thirlage, the dogs of Edinburgh, who greatly harass the sheep, the chief obstacles.

16. Miscellaneous Observations.

The Farmers' Society of Dalkeith, for the prosecution of thirlage and discouragement of agriculture, instituted in 1760, still exists, and has done much good. It is composed almost entirely of practical farmers. Small's plough, the winnowing and threshing machines early noticed and recommended by this society. The farmers in this county have long had in contemplation to get constituted by legal authority, a society for the creation and management of a pensionary fund for the widows and orphans of farmers, on principles similar to those which govern the widows' fund of the ministers of the Church of Scotland.

An appendix to the report contains thirteen papers, some of which are curious in an historical point of view and interesting how soon, in a rapidly improving age, a man's best ideas and remarks are distanced by those of a few years afterwards. One of these papers describes the origin and progress of the British Wool Society, which was begun in this county by Sir John Sinclair, in 1791. The economy of Johnston's dairy is deserving of notice for its accuracy in the details, and for new practices, such as making butter from whey, feeding cows on whey, &c. Macknight, another amateur, and Hepburn, an ingenious landlord and cultivator, are also worth reading.

7048. EAST LOTHIAN. 190,363 acres of surface, under an exceedingly variable climate, the greater part of excellent soil, and well adapted for cultivation, but the southern district, Lammermuir, hilly and mountainous, with a moory soil, severe climate, and chiefly under native grass and herbage. Some of the most distinguished Scotch agricultural patriots, authors, and mechanics belong to this county, as Cockburn of Ormiston, Thomas sixth Earl of Haddington, Fletcher of Saltoun, Adam Dickson, Robert Brown of Markle, the projector, and for a long time editor, of the Farmers' Magazine, Somerville, author of the agricultural Report, Meikle, inventor of the threshing machine, and various others. (*Somerville's General View*, 1806.

1. Property.

Generally in considerable estates; the largest about 15,000l. and not many under 1000l. a year. Tenure generally of the crown, (i.e. freehold), some hold of subjects superior (copyhold), and some of the corporate towns of Haddington and Dunbar.

2. Buildings and Implements.

It may be sufficient to state that they are such as we have described in the body of this work as of the best description. Farms generally large; medium of the county about 4000l. a year; highest 15000l. to 18000l. The first enclosures were made about 1780; farmers were introduced from Holland in 1710; the two-horse plough in 1773; and the first threshing machine in 1786. Fallowing was introduced from Eng^l and about the same time as hedges. The sixth Earl of Haddington was the first proprietor, and John Walker, of Beaton, near Dunbar, the first farmer. He took the hint from some English travellers, while they spent a night at his house, and was whom he had a good deal of conversation upon the subject, so much to his satisfaction, that he made an experiment upon six acres the

following summer, which he carried through in spite of the animadversions of his neighbors, who were divided in their opinions as to the sanity of his mind, or the stability of his circumstances. The result of the experiment gave them a better opinion of both, and the return was so abundant as to induce him to extend his next year's fallow break to twenty acres; soon after which the practice began to spread, and so early as the year 1784, fallowing upon all the deep strong soils was common throughout the county, and has continued to be so ever since. There can be no doubt that the early excellence of the East Lothian agriculture was in a great measure owing to the introduction of fallowing, which, together with the use of drill crops, have continued to place it at the head of the Scotch counties. Potatoes introduced to field culture about 1760; turnips first introduced by Cockburn, of Craigmund, about 1720; introduced and cultivated in the drill manner in 1760. Flax sown from time immemorial, but chiefly on a small scale, and for the home consumption of the country inhabitants. Every cottager has a small quantity, from half a peck to a peck sown, the produce of which furnishes linen for the use of his family.

Lessons tried with the greenest corn, but owing to the climate, it was found to produce less bulk of herbage than red clover.

3. Grass.

Natural meadows and pastures are not admitted into the East Lothian system of husbandry, as they are found only where nature or certain local circumstances render them, in some measure, unavoidable, and are never kept voluntarily, or from any idea of profit. Most farms have a small area of grass for a few years in grass, especially where it has been exhausted by long and imperfect tillage; but fields of this description are not to be ranked as permanent pastures, for the object is to restore them as soon as possible to a state capable of bearing corn-crops to advantage.

Clovers introduced by the sixth Earl of Haddington and Cockburn, about 1730 or 1732, but made little progress till 1740; now generally sown with rye grass. Application, grazing, soiling, and hay, but chiefly soiling.

4. Gardens and Orchards.

Some few market gardens and nurseries, but the climate does not admit of orchards, which are very rare. Every cottage has a garden annexed to it sufficient to produce the various common kitchen vegetables for the cottager's family. This class of people are remarkably attentive to the cultivation of their little spots, and derive great advantage from them, at small cost; the labor is entirely performed after their ordinary work is finished.

5. Woods and Plantations.

Scarcely any of the former, and none of the latter of any extent, excepting in gentlemen's parks. 800 acres on Tynninghame demesne, planted by the sixth Earl of Haddington, who wrote a treatise on planting, about 1715. Others cultivated by Sherrief, of Captain Head, for which, in 1803, he received the gold medal of the Society of Arts.

6. Wastes and Commons.

Are in this as in other Scotch counties, generally enclosed, which is here an easy matter in comparison to what it is in England, in consequence of a general Act of Enclosure by the Scottish Parliament in 1695.

7. Improvements.

Furrow and burning little known, and not wanted, because very little ground is kept long in pasture that can be profitably employed in tillage, and new grass lands do not require these operations.

One attempt at irrigation on a sandy waste near Dumber, the levels of which were taken by, and the water turned on under the direction of the compiler of this work, in 1805.

8. Live Stock.

The practice of East Lothian, in this department, does not present much that can be generally interesting. Grazing, in nine cases out of ten, is carried on only as subservient to tillage, and therefore held a secondary object by cultivators. Cattle are fed, but very few reared in the county. Almost every person who practices the sheep bandwagery, in the lower districts, buys and sells within the year. Some recent attempts have been made to keep flocks of full bred sheep, and there is reason to believe, with considerable success; but, taking the county generally, such attempts are objects of farm management.

Cows. Every farmer keeps a small number of milk cows, but few keep more than are sufficient to furnish a regular supply through the whole year, of milk, butter, and cheese, for their own families. The same attention accordingly is not paid to the kinds of cattle, as in other districts, where they have a more important object of farm management.

A very considerable number of black cattle are purchased annually as fairs and markets, to be wintered in the fold-yard, or fed on turnips in the house. Cattle kept for the dairy, or fed for the butcher-market, comprehend all that are to be found in the county, none are employed in labor. Every part of the labor, in which beasts are employed, is executed by horses.

Sheep. Permanent flocks, and regular sheep management may be said to be almost confined to the higher parts of the county. In the low country they are kept chiefly to eat the turnips, and sometimes a few are permitted to be let to feed, but very few pasture. Flying flocks are therefore generally kept; and as soon as they are fattened for the market, which is usually within the year, they are sold off. A considerable number of lambs likewise are reared, only so far, however, as to render them fit for the butcher.

As the great object in the lower districts is feeding, little attention is paid to particular kinds; every farmer keeps those which he thinks are likely to pay best for the food which they consume. The black-faced, or Tweed-dale breed, are most generally preferred for feeding on turnips, because they are most esteemed in the market; but many of the Cheviot breed are likewise kept, and even the improved Leicester.

The kind of sheep bred, and most generally kept, in Lammermuir, is the black-faced, or more properly what is called the brocked-faced, a sort of dirty looking mixture of black and white; they are for the most part horned: when they are fed, the wethers weigh from ten to twelve pounds per quarter, and the ewes from eight to ten on an average.

The Bakewell breed has been tried, but not extensively; indeed it does not seem well calculated either for the nature of the climate or the quality of the food.

The Cheviot sheep were introduced several years ago, and are kept with advantage in many places. It is not the general opinion, however, that they can ever universally supplant the native breed, or even become equally numerous, with profit.

Of horses very few are bred in the county, not one perhaps in a dozen that are kept. In a district so well calculated for raising corn, it is more profitable to purchase horses, ready for work, than to be at the trouble and expense of rearing them. The farmers here are supplied with this part of stock, chiefly from the dealers of Ayrshire and Lanarkshire, who collect many of them in these counties, and procure not a few from Ireland. The horses generally kept are of that moderate size, which may be considered as almost perhaps to any other of the combining strength with activity. They may be stated, generally, to be about fifteen or sixteen hands high, and strong built. Many teams are well matched, very handsome, capable of great exertion, and kept in excellent condition.

One will hardly be at a loss to determine the character of a farmer, from the condition of his horses. Very fine high bred

horses, exhibiting an appearance of being prepared for the market, may rather suggest the idea of idleness than of labor; but, on the other hand, lean spindly creatures, worn out by toil and hunger, are the certain indicatives of a bad farmer, of one who is not thriving, and does not deserve to thrive. The man who uses bad instruments, cannot have his work well done; and one important and primary step towards good farming, is to keep the laboring stock in good condition. Horses regularly fed and regularly worked will perform a great deal of labor without falling off either in strength or appearance; it is of great importance, therefore, to distribute the labor as equally as possible, through the various seasons of the year; and if, as must sometimes be the case, an extraordinary exertion ought to be made, they are in a proper condition for making it. When horses do fall off, it requires much more to restore them, than might have kept them in a good state.

Hogs are kept in considerable numbers in this county, at distilleries, starch works, mills, and breweries. Every farmer keeps a few, chiefly for supplying his own table, and the generality are able to sell some annually. Farm servants, who have houses, are generally allowed to keep a pig for each family, which adds greatly to their comfort.

Poultry, pigeons, and bees kept to a moderate extent for home use. Much land on the coast, which would be thought by many unfit for any thing but rabbit warrens, now bears turnips and rye.

9. Rural Economy.

There are not, perhaps, in the island more active or correct laborers, than the farm servants here, and certainly none more sober and respectable; and this may, in a great measure, be ascribed to the terms on which they serve. Those servants, who lodge in the houses of their masters, are, generally speaking, on the same footing here as in other places; there is nothing, with respect to them, which merits particular notice.

A small proportion of farm servants, however, belong to this class; married servants are uniformly preferred; those who reside in their master's house are, in many cases, not employed in regular labor, but perform that sort of extra work, and kind of household drudgery, which requires some hands on every considerable farm.

The far greater part of the regular labor is performed by married servants, called hinds; a class more numerous here than in other districts. These dwell in houses provided by their masters, and receive their wages, wholly or chiefly in kind; the circumstances are so comfortable, under which they are generally placed, as to secure a full supply of such servants at all times. They are more steady generally than young men; their families, and the property which they have acquired, give them a sort of interest in their situations, and afford some security for their continuing longer in their places.

The hind occupies a house provided by his master, for which his wife works in harvest; he has a cow kept all the year round, generally ten bolls of oats, three bolls of barley, two bolls of peas, all of the best quality upon the farm, seed corn excepted. He has likewise a peck of fish, seed sown, and about the sixteenth part of an acre of ground, well prepared, and sufficiently dunged for planting potatoes; his fuel is carried, he has his victuals during harvest, which is always four weeks, sometimes six, and when he carries corn to market, he has an allowance, provincially called mags. Those who are employed in sowing and building the corn ricks, will, besides the ordinary wages, a pair of shoes and half a boll of wheat. On a well managed farm, the labor is carried on regularly at set hours; and though it is not understood that servants, who work horses, are absolutely exempt from extra work, yet they are not generally required to do any thing of this nature.

It is evident, that the value of hind's wages, in money, cannot be accurately stated; that must vary according to the market price of the articles in which he is paid. On an average of some years past, it could not be less than twenty-five pounds sterling per annum.

The circumstance, which deserves particular attention with regard to this class, and which renders their condition so much more comfortable than that of the laborers in many other places, is the receiving payment of their wages in the necessities of life. They are far more comfortable than those who receive the same rate of wages in money, any where; they are generally more faithful to their employers, and infinitely more attentive to the interest of their families. They have the necessary articles of food continually at hand, and seldom need to purchase any thing considerable, except shoes. Their wives make linen from their own flax sufficient for their families, and often cloth, for other articles of dress. The quantity of corn which they can afford to sell, with the surplus produce of their cows and hens, brings them as much money as fully answers every demand, and enables them to give a better education to their children, than is sometimes obtained by persons, considerably above their condition, in some other parts of the island. There are few of this class in East Lothian, who cannot read, most of them can write; none of them object to have their children instructed in these necessary branches of education, including the rules of arithmetic. One sees, about every farm-house, a number of children, vigorous and healthy, decently clothed, and exhibiting every appearance of being well fed. Not an instance occurs of any of the people soliciting relief from the public, unless they are by some accident disabled from future labor, or overtaken by the infirmities of age. Indeed the times which are hardest for the lower classes, in general, are usually favorable for them, because the corn and other articles which they have to sell, bears a better price, while what they have to purchase is not so much affected.

The cottage system, which found many advocates some time ago, was inferior in every view of the matter to the manner in which laborers in agriculture are accommodated here. Many of those who labored to introduce the new cottage system, deserved at least for the purity of their motives, every friend of humanity will honor them for the generous intention, which they felt in behalf of the laboring poor; but if they had understood the condition of the hinds in this county, they would have found out a much better plan for accomplishing their object, than giving to every cottager land to produce his subsistence. A hind receives as much of the produce of the tatter as he might be expected to raise, his labor is not interrupted to his employer, nor himself worn out by extra and excessive labor; he has no care upon his mind, no rent to pay, no bad seasons to dread, for whatever may be his master's crop, he is sure of his full share. If the laborer-profit by this system,

the employer and the public profit still more: the employer does not pay a man who wastes half his strength at other work, nor rely on a servant who may sometimes disappoint him, by attending to other concerns. The public must gain in the increased quantity of human food produced, for without doubt, an acre of land occupied by a cottager, will not yield as much at as little expense, as if it made part of a farm cultivated by a person with sufficient capital.

Were all the farm servants over the kingdom paid in kind, it may be safely affirmed, from the experience of the places where this practice prevails, that the advantage would be great to themselves and to the public. The master might probably, in some cases, find it more convenient to give money, but he is far more than recompensed for any trifling disadvantage attending the other mode, by the valuable moral habits which it is calculated to preserve. Every master, who properly understands his interest, will admit, that he had better pay sober,

honest, and industrious servants, than have those of a different description almost for nothing. From their being accustomed to pass little money through their hands, many of the farmers' servants in this county acquire such habits of saving, that they lay up a few pounds for old age, or to meet any contingency which may require more than their ordinary income.

10. *Political Economy.*

The first turnpike bill for Scotland was obtained for this county in 1750. The main roads are on the whole good; but the bye-roads still admit of much improvement. There are no canals or railways; the commerce is chiefly in grain from North Berwick and Dunbar. There are oyster and other fisheries on the coast; and starch works, distilleries, and breweries, but no manufactures deserving notice. No agricultural society in the county; but that of Edinburgh, the earliest in the United Kingdom, was founded chiefly by gentlemen of this county, and especially Cockburn of Ormiston.

7049. BERWICKSHIRE. 304,640 acres, chiefly of gently varied surface, but partly of hilly and mountainous pasture. The soil in the cultivable part of the county, is chiefly light gravelly loam; the mountainous part, which occupies fully one-third of it, is a continuation of the Lammermuir hills. Climate comparatively dry, but cold and late. There are no metals or coal in the county; very little lime, but some stone-quarries of the trap and other coarse stones. Every one knows that this county is one of the best cultivated, and most systematically managed of any in the island, and that its products are nearly equally stock and corn. It is the county of Lord Kaimess, one of the greatest patriots and best agricultural authors, and the first to propose a board of agriculture. It is also that of Small, well known as the improver of the plough. (*Kerr's Berwickshire*, 1808.)

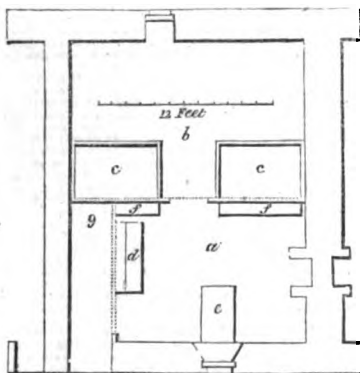
1. *Property.*

No very large estates; largest from 8000. to 10,000. a year. Many of the owners reside on their estates; some farmers have of late years become respectable proprietors. Resident proprietors usually draw their own rents; and those who live at a distance, employ an agent, or, if only temporarily absent, leave it to a bank bill. Proprietors and tenants live in harmony and mutual good will, the rents of the former progressively advancing with the improvements of the country, and the fortunes of the latter augmenting continually, by industrious and judicious attention to improved agricultural practices, and to the amelioration of live stock.

2. *Buildings.*

Farm-houses formerly of rough stone, clay, and thatch, now greatly superior to the houses that were occupied by the middle century, forty or fifty years ago. An excellent plan of a farm given; but the cottages of the hind appear uncomfortably small, and are calculated for close paneled beds, which, wherever health and cleanliness are objects, ought to be discarded. These cottages contain only one apartment, and a sort of dark lumber place, formed by the position of the paneled beds. We much wonder that the reporter, who talks so much of the commodiousness of the houses of farmers, should not have displayed a little more feeling on the subject of the accommodations of cottagers. These remarks apply more particularly to three plans of cottages, given in the general plan of a farmery (*Pl. facing p. 97.*) A detached plan of a cottage (*fig. 811.*) is given, rather better arranged than these double ones, but still, in our opinion, highly objectionable. It has two windows, whereas the others have only one each. The larger window is in the kitchen (*e*), the smaller in the

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back place (*b*); these are separated by two beds (*c*); in the kitchen are shown a plate rack and dresser (*d*), table (*e*), and two chests (*f*). In the lobby a place for coals (*g*). No water closets in any of the plans.

3. *Occupation.*

Farms generally large, and held on lease for different periods, from ten to thirty years, but commonly for nineteen years. Mode of culture aration and pastureage alternately. Under this system of alternation, judiciously conducted, it may confidently be asserted, that a farm of 1000 acres will raise as much grain as one of equal size entirely under perpetual tillage, and will produce in addition, as much beef, and mutton, and wool, as a separate farm of 200 or 300 acres under permanent grass. If this estimation be well founded, of which the reporter has no doubt, this alternate system is obviously of superior profit to the tenantry in the first place, to the landed interest secondarily, by increased rents, and to the public ultimately and always, in the proportion of at least twenty-five per cent, beyond what can be produced from the two branches separately pursued on the same extent of equal land.

In the hill district, the lands are mostly occupied as breeding sheep farms, taking advantage of all the favorable pieces of land, susceptible of cultivation, for raising a little grain to supply the farmer's family, servants, and horses; to afford litter and fodder from the straw during winter, by which dung is produced; to apply that during to raise turnips, to carry on their sheep stock during winter, and, finally, to produce crops of artificial or sown grasses, for hay and pastures, and to the great amelioration of permanent pastures.

In the neighborhood of towns and villages, various small possessions, from two or three acres or less, to twenty or more, are let on leases of various endurance, but mostly for short periods, to villagers who cultivate the land, and who are chiefly occupied in leading materials for road makers, coals to the other villagers, lime, or any such employment as may occur. The great mass of the land throughout the county is let in farms of every variety of size, from 40 to 50 acres, up to 1000 or more, to tenants on leases of fixed endurance, mostly for nineteen years.

The character of farmers in a large district of county must be various; but those of Berwickshire are very generally most respectable and intelligent, and their success has been de- servedly proportional. They have almost universally risen completely above the operative class in knowledge, education, and manners, assimilating in every respect to the character of country gentlemen. In every corner of the county they are to be seen carrying on extensive and costly improvements, by draining, enclosing, liming, and marling; and by careful and judicious improvements of their live stock, sheep, cattle, and even horses, with all the sagacity and intelligence of commercial speculators. They trust to the certain profits of future years to reimburse their large expenditures with reasonable profit, which they are enabled to do through the sufficiency of their capitals, and the security of their leases. The farmer is derived from their own successful and intelligent industry, or that of their fathers, the latter from the good sense of the landlords, in seeing their own interests most materially interwoven in the security and success of their tenants.

4. *Implements.*

No waggons or wheel ploughs, and though drilling turnips is universal, only one or two sorts of drills in use. Few implements, and those of a simple construction, suffice for the best practitioners in every art.

5. *Enclosing.*

The cultivatable lands are universally enclosed, and subdivided into regular fields, generally by hedges; but sometimes by stone walls. In the mountain district, the farms are neither enclosed nor subdivided. The boundaries of each farm are indicated by landmarks, and round each farmery there are generally two or three small fields for convenience or cultivation. Trees very generally planted in hedgerows; hedges always cut with a bill in the wedge shape; never clipped and rounded, or broader at top than bottom; the sure means of hindering the production of side shoots, and in time producing naked places and gaps in that part of the hedge.

6. *Arable Land.*

Ample details of the turnip culture in drills is given.

7. *Orchards. Woods.*

None of the former worth notice. Some native copses and woods, and artificial plantations, but not much woodiness, excepting round gentlemen's seats.

8. *Improvements.*

In this county were begun about 1750, when Swinton of Swinton drained, marled, and completely enclosed his whole estate. Nearly about the same time, Hume of Eccles did the same. Both of these gentlemen were actuated by the example and acquaintance of Cockburn, of Ormiston; Henry Home, Lord Kaimess, was one of the early improvers of this county, about 1746, at Kaimess, now Beboorough. About 1750, the art of enclosing and improving the land, spread generally among the Berwickshire proprietors.

Faring and burning, irrigation and embanking not practised or required.

9. *Live Stock.*

The cattle of Berwickshire are so much mixed by crossing, as scarcely to admit of any particular description. Upon the whole, they are short horned, thin bided, and kindly bodied, and have been much improved by crosses with bulls of the Teeswater breed, which in the time chiefly advanced in this district. Generally speaking the oxen are not carried on to any age, and they are never worked. They are well fed from their youth up, and are generally fed off for market in their fourth year, very few reaching five years old. Cows, on the contrary, are generally old before they are fed off. Goats

numbers of smaller cattle are bred upon the lower hills, and are disposed of to graziers in the low country for feeding, either on grass or turnips, or by a succession of both; and many Highland cattle of various descriptions are brought in yearly for consuming straw, or for feeding on turnips during winter, and on grass in spring and summer.

The sheep bred in Berwickshire are of several kinds. In the most exposed of the Lammermuir and Lauderdale hills, the flocks are mostly of the black faced, or Tweeddale kind, and are there exclusively kept for breeding. In the cultivated tract, the new Leicester breed, in a great variety of degrees of perfection, now universally prevails; and it is believed that no other known breed, in the peculiar circumstances of this county, could be nearly so profitable to the farmer. They require, however, always to have abundance of food, and easily procured; for, being short legged, heavy bodied, and carrying a great weight of wool, they are unable to undergo much fatigue or hardship, and do not thrive unless plentifully supplied at all seasons. This supply, the agricultural system of the district amply affords, and is indeed admirably calculated for providing. On some of the best interior hills, and upon the higher exterior lands, verging on Lammermuir and Lauderdale, called the moor-edges, the Cheviot breed, or long sheep, are kept. An intermediate breed between the Cheviot and Le-

icester, usually called half bred sheep, is very prevalent upon the best of these situations. As a singular circumstance, the reporter records the case of a ewe of this county, which produced eleven lambs in three succeeding seasons.

Horses, as in East Lothian, brought from the west of Scotland.

10. Rural Economy.

Farm servants managed as in East Lothian, and, indeed, almost every where in the low country of Scotland.

11. Political Economy.

Commerce chiefly grain, wool, and salmon; scarcely any manufactures, excepting the paper-mills. The salmon fishery, including Berwick bounds and the English side of the river, employs about seventy small boats, and nearly 300 fishermen. All their fish are sold to a very respectable fraternity of traders in Berwick, named coopers, from their former business of making kits, and boiling the fish, which is now entirely discontinued. By them the salmon are packed in ice, and sent to London, to be disposed of by factors on commission. This employment of ice was first assayed by Messrs Richardson, of Perth, on the suggestion of George Dempster, of Dunnichen, Esq. who had accidentally read that such a practice was not unusual in China.

7060. ROXBURGHSHIRE. 430,048 acres, of which about three-fifths, or 288,048 acres, are in sheep pasture, and the remaining two-fifths, or 172,032 acres, are occasionally under the plough, except about 8000 acres occupied in woods, pleasure-grounds, and the sites of towns and villages. The surface is exceedingly irregular, being in some places ninety, and in others 2000 feet above the level of the sea. The climate is equally various, and excessive rains, winds, frosts, and even hail and snow are by no means uncommon in spring and harvest. The soil is chiefly moss or peat, but there is also light calcareous soil, clay, and loam. Limestone abounds in most parts of the district, and coal has been found, but is not worked. The agriculture of the arable lands is in all respects the same as that of Berwickshire, and that of the pastures resembles the store farming of the latter county and East Lothian. Dawson, of Frogden, belongs to this county, and may be looked on as one of the greatest improvers of British agriculture. (*Douglas's Roxburghshire*, 1794.)

1. Property.

Generally in large estates, and little change of proprietorship has taken place for many years. The largest about 80000. or 90000. a year.

2. Implements. Arable Land.

Winners, the reporter states, were first made in this county by one Rogers, a farmer, of a mechanical turn, near Hawick, in 1753, or at least before 1757, who is said either to have seen a model, or a description of one, which had been brought from Holland. (*Report of Northumb.*)

Arable land enclosed, partly by hedges and partly by walls of loose stones, without mortar.

Ploughing with two horses, without a driver, was practised in this county before it was in any other. It was taught by Dawson, of Frogden, who introduced the drill culture, to James Macdonald, farmer, at Linton, in Tweeddale, alive at the time of making up the report: it spread rapidly afterwards through the county, and the neighboring ones of Northumb. and Berwickshire, East Lothian, and Tweeddale. Potatoes first planted in large beds about 1794; in 1768, in drills in the fields. Tobacco, during the American war, was cultivated to a considerable extent in the neighborhood of Kelso and Jedburgh, and in some other spots. Its produce was so great, that thirteen acres at Crailing, Jedburgh, at the rate of four-pence per pound, and would have brought more than three times as much, had not an Act of Parliament obliged the cultivator to dispose of it to Government at that price. This county lost about 150000. sterling by that Act, which passed while the tobacco was growing; yet it cannot be so much mourning and clamour among the sufferers as have been elsewhere re-

peatedly raised, with less reason, against other Acts in no respect so arbitrary and oppressive.

3. Gardens and Orchards.

Thriving better in the lower parts of this county than in those on the east coast. At Melrose, Jedburgh, and Kelso, are the remains of orchards planted by the priests several centuries ago, the pear-trees of which are very productive. Wonderful stories are told of their fertility. A single tree of the thistle pear at Melrose has for these fifty years past yielded the interest of the money paid for the garden where it stands, and for a house let for seven pounds sterling yearly. Another tree there has carried fruit to the amount of three pounds annually, at an average for the same period. In the year 1793, 120 trees there brought to perfection about 60,000 pears, which were sold for eight guineas. These facts are well authenticated. There are also several more recent orchards near the same places, and 1200 acres of nurseries. Of these one of the oldest and largest in Scotland is that of Messrs. Dicksons, of Hawick.

4. Woods and Plantations.

To the extent of 5290 acres; nearly two-thirds artificial.

5. Live Stock.

Cattle, a mixed breed, as in Berwickshire. Sheep of the Cheviot kind greatly improved by a cross with the Dishley breed, introduced about 1765, by Robson, a pupil of Culley. Merino and other sorts have been tried, but sufficient time has not elapsed to ascertain the result.

6. Rural and Political Economy.

Farm servants on the same plan as in East Lothian. Roads improving; no canals; little commerce, and almost no manufactures.

7051. SELKIRKSHIRE. 160,600 acres almost wholly of mountainous surface, the lowest part 300 feet above the level of the sea; many houses are 600 and some more than 1000 feet above its level. The highest mountain is 2370 feet. These mountains are generally of granite or whinstone, and the surface soil is commonly gravelly and pent up; the rocks of the mountains are freestone, granite, trap, or claystone. There are no metals, nor coal, lime, or freestone. The most remarkable thing attending this county is that its hills and mountains are almost everywhere clothed to their summits with sound sheep pasture, of which there are estimated to be 148,000 acres; 8800 acres in aration, 2000 in wood, and the rest in gardens, houses, roads, lakes, &c. (*Douglas's General View*, 1796.)

Property in few hands, and in large estates. The farms are large, and the leases generally shorter than on arable farms. The sheep are a variety of the Cheviot produced by repeated crosses with the native mountain black-faced breed. In all respects the husbandry of this county may be considered the same as that of the mountainous districts of the preceding

counties. There is a woollen cloth manufactory, and an excellent porter brewery, by a pupil of Meux, at Galashiels. Some agricultural societies were attempted in this and the adjoining counties about 1795, but they were of very short duration.

*** 7052. PEEBLESHPHIRE or TWEEDDALE.** 229,778 acres, mostly of mountain, moor, and bog, but with about one-tenth part arable. The lowest part of the county is 400 feet above sea level, and grain is cultivated to the height of 1000 feet. The climate is late, cold, and moist, and the soil moory, clayey, or sandy, according as the water is pent up; the rocks of the mountains are freestone, granite, trap, or claystone. The only minerals worth notice are lime, whinstone, and freestone. The general appearance of the country is wild, and rather dull and dreary, as romantic or sublime. The agricultural survey of this county is by the Rev. Charles Findlater, and it abounds with more valuable matter on political agriculture, on leases, prices, restrictions, markets, &c. than any survey that has been published, without a single exception. In fact, it was found to take such a mastery view of the moral incitements to agricultural industry, that it was rejected by the Board, and the author was reduced to publish it himself. It has certainly, through the medium of the extracts from it published in the *Farmers' Magazine*, been the means of enlightening thousands, both of farmers and landlords. The fundamental principle which Findlater lays down and illustrates under the heads of leases, size of farms, usury, capital, dearth, monopoly, forestalling, government interference, tithes, poor, and other topics, is, "That the best mode of insuring the invention and prosecution of the most advantageous measures is, an arrangement which shall communicate to those on whom their execution is devolved, a sufficient personal interest in their invention and execution." To some he doubts not such views will be considered as foreign to the report of a county; whilst, to others, they will constitute its most essential value.

The state of property and husbandry of the country may be considered as the same as that of the other mountainous districts. The black faced sheep are in almost universal use, excepting in milder situations, where the Cheviot has been introduced. There is no commerce but by retail, and only some very trifling woollen manufactures in the country.

In the Appendix an account is given of the improvement of the Whim, a flow-moss of 100 acres, twenty feet deep, and at an elevation of 700 feet above the level of the sea. It was begun to be drained in 1751, and in ten years a mansion was built, and surrounded by woods and pleasure-grounds, which shew, as the Duke of Buccleugh, the proprietor, intended, the wonderful influence of art over nature. "The plantations (originally extensive) have been improved and enlarged since the property came into possession of the Lord Chief Baron; and he has also greatly enlarged the house, adding a court of offices, upon a large scale, and ornamented in front, extending also the lawn. The place has, upon the whole, an air of magnificence. In the pleasure-grounds, there are several artificial pieces of water. East of the house (where the soil is dry, and covered with sweet grasses) the surface is agreeably diversified by gentle swells, tufted with trees. A wild wilderness walk, through a small wood, lands you upon the banks of an artificial lake, with islands, covering an extent of six or seven acres of surface. What chiefly strikes the visitor at Whim, is the strongly marked contrast betwixt the improvements of human art, and nature in her wildest form, here found in immediate contact. Your ears are, at once, saluted with the warblings of the black-bird and thrush, from the plantations; and the wild notes of the plover, the curlew, the grouse, and other moss birds from the flow-moss." (*Findlater's Report*, &c. 1804.)

7063. DUMFRIESSHIRE. 644,385 acres of maritime, vale, and mountain lands, in the proportion of 1, 4, and 7. The climate is variable, comparatively mild, but moist. The soil of the maritime district is light, and generally on sand, gravel, or rock; that of the vale or midland district is gravelly, sandy or moory. The mountains are of schist, whinstone, or red freestone, and thinly covered with corresponding soils or moss. In some places they are covered with dry pasture, but more frequently with a mixture of grass and heath. The principal metallic ore found in the county is lead; but several others, as iron, copper, antimony, &c. exist, and the latter has been worked. Coal has been found, but not in strata sufficiently thick to be workable. Marble also and slate have been worked, and lime, freestone, and whinstone, in abundance. There are several mineral springs in the mountain district, the principal of which is the *spaw*, at Moffat. Fish, and especially salmon, are caught in moderate quantities in the Nith and Annan. The celebrated improver, Craik, was a proprietor in this county, at Ardbigland, near Dumfries, now the property of his son. (*Dr. Singer's General View*, 1812.)

1. Minerals.

The lead mines occupy very barren grounds, remarkably bleak and elevated; but they are a great fund of industry and riches, and they furnish a part of the county with an excellent market for the surplus grain produced in that part. Lead-hills, with the mines, are in the county of Lanark, and belong to the Earl of Hopetoun, who draws about 7000*l.* a year from these mines. Wanlockhead mine is in Dumfriesshire, belongs to the Duke of Queensberry, and returns to the proprietor near 5000*l.* a year.

2. Property.

In large estates, owned by 453 persons. The Duke of Buccleugh's estate of very great extent. Some estates are managed by their owners, and others by commissioners having power to let. In large properties it is common to entrust the collecting rents, and arrangements relative to leases, buildings, fences, and courses of crops, to factors residing on or near the lands, who represent their constituents (if not personally present) in county and parish meetings. Millar, of Dalswinton, has gone over an estate of 5000 acres, in twenty-five years, and improved the whole of it, with the exception of a portion which is now under process, and promises to be soon completed. His plan is, not to farm his lands himself, but to prepare them, by improvement, for being let to farmers.

3. Buildings.

While the reporter expatiates on the ample accommodations of the modern farm-houses in this and other counties, he gives the following information as to cottages, which we regret to find seem by no means improved either in this or in other parts of Scotland in the same ratio as the habitations of inferior animals. "A common, and not inconvenient cottage, is put up as follows; viz. stone and lime walls, seven feet high, thirty-six feet long, and fourteen to sixteen feet wide within; the roof of Scots fir, which is preserved from the worm by smoke, and covered with thatch; a chimney at one end, and an open passage for smoke in the other; affording two apartments below, one of them a kitchen, and a central apartment opposite to the door; the one end boarded over, and the other open. Such a cottage may be erected for about 50*l.* or 40*l.* and, with half a rood for a garden, it would let at 3*l.* a year or more, according to its finishing." Doubtless the reverend gentleman makes but short prayers when he visits the sick in such smoky cottages:—the surgeon may speak to his patient through the window.

4. Occupation.

Sheep farms from 300 to 3000 acres; arable farms from 50 to 600 acres. Leases universal, and generally for nineteen or twenty-one years. Wilkie's variation of Snail's plough is in general use, as clearing the mould-board better in soft soils. The Berwickshire system of culture is practised on the turnip soils; the East Lothian on such as are loamy or clayey; and the stone system on the mountain district. The cattle are of the Galloway breed, and sheep, Cheviots, or the black-faced mountain kind. More poultry is kept than in most other counties, in order to consume the light grain. Many of the fowls and eggs go to Edinburgh; but the greater part of the produce and sales in eggs go in small oval baskets, packed in carts, to Berwick, for the London market. In one or two instances the *holcus lanatus* has been cultivated on reclaimed bogs with success, but is intended to be succeeded by better grasses as soon as they will bear them. The drill culture of turnips was introduced by Craik, about 1745. Draining has been extensively practised; irrigation in a few places, and some embankments made on the Solway Firth, and the Nith and Annan. There are few orchards. Some remains of coppice and forest, which, according to appearances and authentic records, seem in former times to have spread over great part of the county; and numerous young plantations. Some years ago many young Scotch fir died from the attack of the *Teredo pinorum*, as some suppose; but the cause does not seem clearly

known. Some very large oaks, beeches, elms, ashes, and larch firs, are described in the report.

5. Improvements.

As a specimen we shall give some notices of what has been done on the estate of Mount Annan, by Gen. Dirom. The extent of Mount Annan estate is 2748 acres. The major began his improvements in 1793, and planted before 1819, 168 acres. Assisted in laying out a considerable extent of public road and building bridges, the road passing through the estate. Made an improvement in the construction of lime kilns, since perfected by Hooker, of Dublin. (588*l.*) The lime quarried and dried by means of a small stream from more elevated lands; this stream being made to turn an overshot wheel, which works two pumps. The village of Bridgehead begun in 1800 (3575*l.*) on the new road, and where the river Annan affords ample falls for machinery. Farms arranged of different sizes, and three eminent farmers settled with a view to improvement. Cottage farms one or two; cottages; improved stock on the demesne farm; improved farm buildings; leases for fifteen years; stone quarries opened, others drained and improved; brick clay found, and bricks made; salmon fishery improved. Irrigation, forin, spring wheat, moss composts, mule plough, and steaming apparatus, introduced. A cross-moss-cutting machine, invented by the overseer, William Holliday, for cutting the furrows across in improving moor, instead of cross-ploughing, which is not only a very laborious operation, but seldom succeeds in cutting them into small enough pieces, so as to be afterwards easily harrowed. This machine consists of two circular knives, if they may be so called, six inches deep in the blade, with a blunt edge, fixed upon and embracing the whole of the exterior circle of two small broad wheels, and as they go round the knives cut the furrows across. The axle and frame of a roller are used for these wheels, so that the weight may be increased by loading the box of the frame, if it should be necessary to make the knives cut through the furrows. It is dragged with great ease across the ploughed moor by one horse; and, when it is moist, the furrows are cut through with the greatest facility, in pieces of any length, according to the number of turns taken by the machine. The furrows, when a little dry, are then turned over by the brake (breck) harrow, and being all cut into small pieces, are in the best state for being reduced by repeated harrowing, or for being thrown together in heaps and burnt.

6. Weekly Reports.

"In carrying on the improvements which have been mentioned, at a considerable distance from my general residence, it has been greatly facilitated by requiring my overseer, or manager, to send me a weekly report of what was doing upon the farm and the estate. It shows how the servants and laborers have been employed during every day, contains a journal of the weather, and of the progress of different works, and a state of his receipts and disbursements during the week. These reports, besides enabling one to judge of what is doing, and to give any directions that may be necessary, are extremely useful to refer to, and excite the overseer and servants to be diligent in my absence."

Increase of population on the estate in fifteen years, 296; viz. from 175 to 571 inhabitants. Total expense of purchase and improvement, up to 1811, 30,000*l.* Civil annual rental at that time, 2000*l.* a year, exclusive of the value of timber and of the mansion, garden, and hot-house, &c. as a gentleman's residence.

7. Political Economy.

Improving roads, and some canals and railways; some commerce by sea with the port of Dumfries; manufactures inconsiderable; paper, stockings by frames, muslin weavers. A small iron-works at Kirkcunell, in which from three to four dozen spades daily are made. Cotton spinning and weaving in a few places. Carpet weaving, &c. "Salt, from the rich esterts of the sea beach, collected with horse drags, in dry weather, and summer, and then placed so as to be washed and filtered, and the brine that runs out of it boiled."

7054. KIRCUDBRIGHTSHIRE, 561,641 acres, and **WIGTONSHIRE** 305,613 acres, possessing great similarity of agricultural character, have been included in one report, as the district of Galloway. The climate moist, but rather warm; in some parts of Wigtonshire in genial seasons, figs ripen on the open garden walls. The soil and surface of Galloway is exceedingly various. Almost the whole of Wigtonshire is very little elevated above the surface of the sea, but great part of Kircudbrightshire is hilly and mountainous. The better soils are for the most part light, and of this and hazel loam there is a considerable portion in Wigtonshire. In some places in Kircudbrightshire it is clayey or alluvial, and there is a great deal of peat-moss, and bog, as well as improved, or grass bearing peat. The rocks of the county are argillaceous, granite, or whinstone, with some freestone. Some mineral veins have been found; and one of lead, near Gate-House of Fleet, was worked at the expense of the compiler of this work for some time, but without success. In an agricultural point of view, Galloway is chiefly remarkable for its breed of cattle. Gladstone, a millwright, who has invented a reaping machine, and proposed some improvements on the threshing machine, and other implements, is of this district. (*Smith's General View*, 1810.)

1. Property.

More divided than in most of the counties of Scotland. Largest estate, 30,000*l.* a year, Earl of Galloway's, in Wigtonshire. Estates in general well managed; landlords in general advance money at five, six, or seven and a half per cent. for buildings, fences, drains, mineral manures, roads, &c. Dunbar, Earl of Selkirk, a disciple of Craik's, one of the first who set the example of improvement, which has been persevered in by the same family to the present time.

2. Occupation.

In the moors, where breeding cattle and sheep is the object, farms sometimes seven or eight miles square, some ten or twelve. Arable farms 300 to 600 acres; 200 acres perhaps the average. Leases nineteen or twenty-one years, to which the late Earl of Galloway superadded the tenant's life. "From two good effects were supposed to result; 1st. That the landlord was freed from the expenses of buildings and repairs. 2dly. That the tenant presuming (as we always do) on the continuance of life, would be disposed to go on with his improvements to the last. There is certainly, however, much liberality in the idea."

3. Enclosing.

Galloway dykes (255*5*.) very generally in use; some useful remarks on the necessity of bonding them sufficiently, and working the coping-stones to a flat under-surface.

4. Arable Land.

Till the middle of the eighteenth century, four and sometimes six horses yoked abreast in the old Scotch plough, and tumbrils (carts with low wheels without spokes) and cars in use; now all the improved implements; the husbandry of East Lothian on the alluvial lands and moors, too heavy for turnips; that of Berwickshire on the turnip soils; cattle bred on the mountains and moors; carrots cultivated in some places, and found to answer well; floric tried on bogs; some irrigation; embanking near Wigton and at Kircudbright, and much draining; also paring and burning, and various other means of improving bogs and flow moors tried in conjunction with draining. Corn in the late districts gaited. (2940.) Barley is a good deal cultivated, and thin hot barley cakes, from dough, baked the same morning, and spread first with butter, and then with honey, and folded or rolled up (like the telf of the Abyssinians), form a part of the breakfast bread of all who can afford it in Wigtonshire.

5. Orchards.

Rare. "Some proprietors furnish their tenants with fruit-trees for their gardens, when they are willing to be at the trouble of cultivating them. But, from the scarcity of fruit in the country, and the idea that the plundering of an orchard is a very venial trespass, such as do cultivate them, frequently do not gather the fruits. In this we believe there is nothing peculiar to Galloway. There are a few market gardens and several nurseries."

6. Woods and Plantations.

Of a very limited extent, but rapidly increasing. John, Earl of Stair, planted extensively at Mount Kennedy, in the beginning of the eighteenth century; and Douglas, Earl of Selkirk, soon afterwards. The Earl of Galloway, the present Earl of Selkirk, Murray of Broughton, and various others, are great planters.

7. Live Stock.

The Galloway breed of cattle is well known. The breeders perhaps, in general, understand the management of cattle as

well as, or better than, most others in the kingdom. They all know to distinguish a good bull or a good cow from a bad one; and fail not to select from their own stock such as are best adapted for the improvement of the breed: and from this general attention, it no doubt arises, that the cattle in Galloway are pretty uniformly good. But among them have arisen no enthusiasts in the profession; none who have studied it scientifically, or dedicated their talents almost exclusively to this one object. No fair test has yet been given, of what might be done by a proper selection of the choicest individuals of both sexes, for breeders, and uniting them in such a manner, as seemed best calculated to diminish their faults and heighten their properties, by crossing the progeny of these from time to time; and still carefully pursuing proper combinations of the most approved males with the finest females, till the improvement was carried to the greatest perfection of which the breed is susceptible. No Haverells, no Cullens, no Collings have yet appeared in Galloway; who, with a skill, the result of long study and experience, have united sufficient capital, and by the success of their experiments have made great fortunes, and transmitted their names to the most distant parts of the kingdom. Few of the Galloway cattle (comparatively) are fed for home consumption. Dairying with Ayrshire cows has lately been introduced, and very good Dunlop cheese made.

The sheep for the low districts are of various breeds, those of the highlands the same as in the mountain districts of the counties already described. The South Down is found to answer well in Wigtonshire, and also the Leicester.

Horses. Galloway formerly possessed a breed of horses peculiar to itself, and in high estimation for the saddle; being, though small, exceedingly hardy and active. Accustomed to a rugged and mountainous country, and never employed in the draught, these were sure-footed, and travelled with spirit in very bad roads. They were of a larger size than the ponies of Wales, or the shetties of the north, being from twelve to fourteen hands high. It is reported that this breed originated from Spanish horses, which escaped from a vessel of the Armada, that had been wrecked on the shores of Galloway; but it appears probable from some passages in Shakespeare, that the Galloway horses were in repute at an earlier period. It is much to be regretted that this ancient breed is now almost lost. This has been occasioned chiefly by the desire of farmers to breed horses of greater weight, and better adapted for the draught; and from the little value attached, in times of tranquility, to horses well calculated for predatory excursions. As the soil and climate of Galloway are peculiarly adapted for rearing horses, there cannot be a doubt that under proper management, they would in general become excellent, and add much to the value of its produce. Hitherto few more have been bred than what is necessary to supply the demands of the district.

Bees increasing since the introduction of potatoes; and the prejudice against eating the flesh common to this and most districts of Scotland gradually declining. Ringing not practised, but the two strong tendons of the snout cut by a slight incision, about an inch and a half above the nose, when the animal is about two months old.

Bees of this district produce honey equal, if not superior to any in the world; its excellence supposed to depend on the profusion of wild flowers, especially white clover and heath.

Game abundant; a few ptarmigans in the highest mountains.

8. Political Economy.

Roads greatly improved of late, and some cotton, woollen, paper, and other manufactories introduced.

7055. AYRSHIRE, 664,960 acres of irregular but not mountainous surface, and clayey or mossy soil, under a moist climate; half the county bog, hilly pasture, or waste, and the rest chiefly under alternate grass and corn. The agriculture followed is in great part the dairy system; Dunlop cheese, already described (635*3*.), being chiefly produced in this county. (*Aiton's General View*, 1811.)

1. Minerals.

Coal and limestone are to be found in most parts of the county, and there are several kinds of building stone, but no metallic ores worth working, excepting iron. Coal is the staple mineral, and is exported in large quantities to Glasgow and other towns, along the west coast, northward and southward.

2. Buildings.

Some good castles and mansions, as Culzean, Loudon, Eglington, &c. Farm buildings are improving, though but slowly. Some neat elevations, and comfortable interiors on Lord Eglington's estates; single, (fig. 812*a*), and double (b). Each of such cottages is surrounded by a neat garden, containing a pigsty, pump, and bee-house; and the house containing a porch (1), kitchen, oven, and stair to bed rooms (2), parlor (3), store closet (4), bed closet (5), pantry (6), coal closet (7), back entrance (8), and water closet (10), with two garret bed-rooms over.

3. Occupation.

Farms small, from 50 to 150 acres, and their culture imperfect and irregular, though rents are high from the population of the manufacturing towns.

4. Live Stock.

Horses are bred and sold under the general name of Lamarkshire or Clydesdale, and are in great demand; as are the Ayrshire cows for the Edinburgh and Glasgow dairymen. Indeed these cows are preferred to all others in most parts of the low country of Scotland.

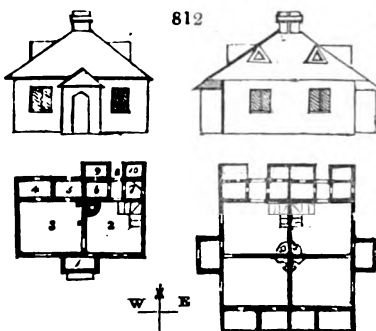
5. Woods and Plantations.

Most of the proprietors are extensive planters. On the Culzean estate are extensive woods, raised in the face of the west winds; most of the trees lean to the east, excepting the common maple, which is generally erect, or nearly so, and is one of the best trees for an exposed sea coast. There are a few native coppice woods, and some fine old birch, ash, and oak trees round Eglington Castle.

6. Improvements.

Captain Smith, the proprietor of a small place abounding with peat bogs, about 1790, began to drain and dig, and lime the surface, and succeeded in reducing the peat to a black mould, and rearing tolerable crops of oats, potatoes, and clover. Af-

ter five or six years, he was able to venture horses and cattle on these bogs; but at first every operation was manual.



7. Political Economy.

Carpet and other woollen manufactures at Kilmarnock: thread at Beith, cotton at Cathrine, iron at Muirkirk, salt and kelp on the shores, earthenware and the usual minor manufactures, as leather, hats, &c. at various places.

7056. LANARKSHIRE or CLYDESDALE. 556,800 acres, in great part mountain, moor, and peat-bog, with a portion of friable loam, and some retentive clays. The climate is cold, moist, and unfavorable, excepting in the low vales, where vegetation is chiefly injured by spring and autumn frosts. Average of the rain which falls at Glasgow, 30.8 inches. The minerals are lead, ironstone, coal, limestone, freestone, and whinstone, all worked to a considerable extent. The lead mines at Leadhills, have been already noticed under Dumfriesshire. The husbandry of the county is chiefly distinguished for its breed of horses, and for orchards, the latter a rare production in Scotland. John Naismith, the author of a work on Industry, another on the Elements of Agriculture, and also of the Report, seems to have been a native of this county. (*Naismith's General View*, 1803.)

1. Property.

Three-fourths of the surface, the property of great landholders; the rest much divided. Farm-houses and offices were formerly very indifferent; but in this as in other adjoining counties, when the leases of farms fall in, the landlord generally enlarges or renews the buildings, as a necessary step to getting the full rental value for the land. A good deal of ground fenced out to operative mechanics, weavers, &c. for building cottages.

2. Occupation.

Much the same as in Galloway. Breeding farms are large, and corn farms moderate. The mountainous district is occupied mostly with flocks of sheep: upon the ridges on the E. and W. sides, where the ground is marshy, and less proper for sheep, and the exposure too bleak to encourage the cultivation of corn, cattle are mostly pastured, and those generally milch cows and their young, many of which are reared; a small quantity of corn only being cultivated, principally for the sake of winter provender. The less rugged and less exposed parts are more occupied in the culture of corn; and the banks of the Clyde, between Hamilton and Lanark, with orchards.

3. Gardens and Orchards.

Glasgow is abundantly supplied with the common culinary vegetables from market gardens. Orchards are chiefly found in two districts in Scotland, in Clydesdale, and the Carse of Gowrie. "The Clydesdale orchards lie mostly between the bottom of the lowest fall of the river, and the mouth of the south Calder. They are chiefly of apples, with a mixture of pear trees, and some plumbs. Cherries are more rarely cultivated, being much subject to the depredations of birds. Few of the orchards are large, but many small ones are planted up and down the country. The whole may cover 340 acres or upwards, and are on the increase. The produce is very precarious, the fruit being frequently destroyed in the blossom, by spring frosts and caterpillars. The value of the fruit is not always in proportion to the number and size of the trees. Those who cultivate the ground around the trees, taking care not to injure the roots, and giving manure from time to time, have finer fruit, and a much greater quantity in proportion, than those who do not. Much also depends on adapting the trees to the soil and exposure. These orchards are mostly planted on very steep hanging banks, and on such they have been found to succeed better than on plains, as subterranean water flows most quickly away. Most of them stand on soils greatly cohesive, and on such the trees have been supposed to be surest bearers than on open sandy soils; yet there are instances of orchards, on friable and gravelly soils, uncommonly

The harbor, and other works carrying on at Ardrossan, under the auspices of the Earl of Eglinton, and the harbor of Troon, and the railway from thence to Kilmarnock, formed almost entirely at the expense of the Duke of Portland, are worthy monuments, as less of the enlightened judgment and energy, than of the wealth of these two patriotic noblemen. The harbor will, when completed, be one of the safest, most capacious, and most accessible on the west coast of Britain; possessing many advantages over the harbors in the Frith of Clyde, situate in a narrow channel, which can be navigated only when the wind blows from particular points, and which, far upwards of twenty miles below Glasgow, is both shallow and dangerous. A circular pier of 900 yards was finished in 1811, and every thing was then ready to begin the wet-dock, which, according to Telford's plan, was to contain from 70 to 100 vessels, in water sixteen feet deep. The works have rather languished of late, and are not likely to be completed soon without public aid. It was part of the Earl of Eglinton's plan to raise a neat regular built town at Ardrossan, in which some progress has been made; and he has constructed excellent baths, which draw to it a number of visitors at the proper season.

The harbor at Ardrossan was only a part of the general plan, and that from which, viewed by itself, the smallest advantages perhaps were to be expected. The leading idea was to open up a direct communication between Glasgow, Paisley, and other large towns in the vicinity and the west coast, instead of the present circuitous passage by the Frith of Clyde. A canal was therefore to be cut from Glasgow to Ardrossan, about thirty-one miles and half, at the estimated expense of 125,000*l*. Of this only a third has been yet executed, that is, from Glasgow to Johnstone, and this part has cost about 90,000*l*.

The harbor at Troon, connected, as it now is, with Kilmarnock, by means of an excellent railway, seems to possess almost all the advantages of that of Ardrossan, and promises to become, in a much shorter period, of vast utility to the populous country around it.

productive. Plumb trees are generally planted round the verge of the orchard, and are profitable, not only for the fruit they bear, but for sheltering the other trees. The depredations committed on the orchards are become more frequent and daring, as the manufactures of the county have increased, and are a great discouragement to this species of cultivation, particularly that of small orchards, which cannot defray the expense of watching in the night."

Besides the larger fruit, great quantities of gooseberries and currants are cultivated, and, when well managed, are said to pay very well. The gooseberry and currant trees are dug around annually, kept on a single stem, and dunged every second year.

Cops, Woods, or native timber trees, are not abundant; the oldest trees are on the Clyde, in and near Hamilton Park and Bothwell Castle. Many new plantations are forming in every part of the county.

4. Live Stock.

Cattle a mixed breed; the Ayrshire beginning to become general. Oxen formerly employed in labor, and still used by a few of the amateurs in spite of the better service of their tenants and bailiffs. Few sheep kept, excepting on the mountains, where the black faced sort prevails.

The draught horses of Clydesdale have long been in high estimation. Dealers from different parts of England come to the Glasgow and Rutherglen markets to purchase them, and prefer them to the Derbyshire blacks. Those of the upper ward, where the greatest number are bred, are esteemed the best. They have been much improved of late, and are still improving, especially in size and weight.

Hogs. "A kind of Jewish abhorrence of swine seems to have taken place, about the rigid times of the Reformation, in the western counties of Scotland. They were unclean beasts; it was sinful to eat their flesh, and neither creditable nor profitable to keep them. And though these prejudices are now pretty much worn out, pork is not yet, in general, a favorite food, and, of course, the number of hogs kept and fed are not considerable."

5. Political Economy.

The roads are in many places bad, but have lately been improved; though the materials be good and abundant, the wet climate is much against them. There are several canals, the river Clyde, navigable to Glasgow, and some railways. The manufactures and commerce of Glasgow are of great extent and well known. There is a corresponding agricultural society there, and some minor societies.

7057. DUNBARTONSHIRE. 147,300 acres of exceedingly irregular surface, in two parts, distant from each other six miles; possessing little agricultural interest. The arable lands are of very limited extent, and lie chiefly on the banks of the Clyde and Leven: the greatest part of the county consisting of lofty mountains incapable of cultivation. Coal, lime, freestone, and ironstone abound, and are extensively worked. There is also ochre, schistus abounding in alum pyrites, which are made into coppers, and a large quarry of blue slate. Lochlomond is well known for its scenery. (*Whyte and Macfarlane's Report*, 1811.)

1. Property.

Two large estates; one exceeds 3000*l*. a year. One third of the county under arable, which greatly retards its improvement.

2. Buildings.

More than a common share of elegant villas and gentlemen's

houses. The most magnificent is Rosneath, the Duke of Argyll's, built by Bonomi, in 1803 of grey. It is 184 feet long, and 121 in breadth, with two magnificent fronts, both ornamented with columns of the Ionic order. On his Grace's Farm, which is cultivated in a very superior style, there is also a large set of farm offices, surmounted with a high tower. Common farm-

houses and cottages formerly very wretched, beginning to improve, but the progress slow. Dunbarton bridge, 300 feet in length and twenty-five feet high in the centre.

3. Occupation.

Average extent of arable farms fifty acres; sheep, or mountain farms, average 600 acres. Farmers men of limited education, without capital, and implicitly following the practices of their forefathers. There exists among the laboring class in this district, an inveterate attachment to the possession of land. When a young man is disposed to marry, he looks out for a small farm, takes it at an extravagant rent, stocks it on credit, and draws from it a scanty subsistence, while at the end of his lease his effects are often unequal to pay the debt which has accumulated during its currency. In fact, the feudal state of society has not entirely disappeared in this county. There were lately, on many estates, and are still on some, farms let to three or four tenants, as conjunct tenancies, while at the end of their united, or rather discordant exertions. Lands always let on lease, seldom for a shorter period than nineteen years.

4. Implements.

Curved harrows of a semicircular form are used by the best farmers for dressing their potatoe ridges. The diameter is equal to the distance between the drills or ridges, generally near three feet, and they are used, before the young shoot of the potatoe springs, to dress the surface of the ridge, and destroy any weeds which may have begun to appear. The highland hand-harrow is still in use in some corners of the highland district. It is about two feet long and fifteen inches broad, consisting of three bulks, and as many cross bars, with twenty-seven teeth, and two handles bent, like a hoop, with which it is wrought. It is employed on bits of land, which have been dug with the highland spade, either on account of their being too steep to be tilled by the labor of a horse, or from their consisting of a number of small corners among rocks and large stones, to which a common harrow could not find access. Wilkie's wheel plough with a shifting muzzle (fig. 815) is used to clear

among the rocks, seems to be particularly adapted to the growth of oak coppice, which, from its superior value, is chiefly encouraged in such situations, while the moister and more unfavorable spots are allowed to be occupied by less valuable trees. These are chiefly ash, yew, holly, mountain-ash, birch, hazel, aspen, alder, crab, thorn, and willow. The seven last kinds are considered inferior in value to the rest, and commonly known by the name of barren timber.

Copewoods are cut from the twenty-second to the twenty-fourth year: after the latter period, the bark of oak becomes hard and corky, and of less value to the tanner.

Plantations very generally formed on the uplands. 1000 acres planted at Luss previous to 1760. The Duke of Montrose, a great planter in Stirlingshire, and partly in this county, sows 200 Scotch pine, 400 larch fir, and 1000 hardwood trees to an acre: prefers oak plants of several years' growth; and after they have been established several years cuts them down, when they push long and strong shoots. Plants by stellate slits, already described (366b), as pits in a retentive soil only serve as a receptacle for water. Fir, pine, and all trees now regularly pruned.

The finest tree in the county is an ash in Bonhill churchyard. Its trunk is about nine feet high, and, where smallest, upwards of eighteen feet in circumference. Of the three principal arms into which it branches, the largest is the eastern, and the smallest near ten feet in circumference. The branches spread in every direction with uncommon regularity, covering an area of near 100 feet in diameter, and the general aspect is singularly venerable and majestic. There are no data from which its age can be conjectured. Near 100 years ago it was remarked by Marsham of Stratton, near Norwich, a celebrated planter, as one of the first ashes he had seen, and a tendency to decay in some of the boughs, seems to indicate that it has stood there for several centuries.

Few trees and bushes abound on the banks of Loch Lomond. A yew at Rosedale is twelve feet round and very high: one at Stockinibber twenty-eight feet round, and the top spreading in proportion.

9. Improvements.

Some proprietors have drained bogs, and rendered them tolerable meadows; and drained and planted moors. Moors sometimes burned, the ashes ploughed in, and the land cropped with oats, &c.

Irrigation by means of the rills on the hill sides, tried in some places with success.

Swamp-lands have been made on a small scale, and some of considerable extent might be formed with success.

10. Live Stock.

Highland cattle from Argyshire in general use; but little feeding, dairying, or breeding of this species of stock. Sheep of a small black faced kind, bred in the county to the extent admitted by the upland pastures. Horses a small, hardy breed.

Hags increase as the prejudice against pork disappears. 200 fallow deer occupy two of the largest islands of Loch Lomond. The stag, or red deer of the mountains, has disappeared since the introduction of sheep. A few roes still inhabit the woodlands.

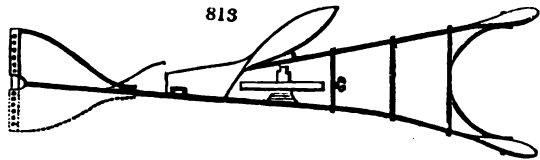
Bee common.

11. Political Economy.

Manufactures of iron, glass, cotton, paper, alkali, printing and bleaching works, &c.

Window-glass manufactured extensively, and equal in quality to any in the kingdom. Pay 3500*l.* a year of excise duties; employs 10,000 tons of shipping, and consumes 1200 tons of kelp. The distillery of pyroligneous acid, at Milburn, employs about seven hands, and consumes daily a ton of small timber, chiefly oak, from which the liquor, a kind of coarse vinegar, is extracted. The process being very simple. A number of iron ovens, or retorts, are placed in rows, and filled with the timber cut into small pieces. A fire of coals or charcoal is kindled in a furnace attached to each, and by its heat forces the acid to fly off in the form of vapor. This vapor is conducted by a small tube proceeding from each retort, into a refrigeratory or long metal pipe, on which a jet of cold water from above continually falling. Here the acid is condensed, and runs from the end of the pipe in a considerable stream, of a reddish brown color. Besides the liquor thus procured, which is employed in mixing colors for the calico printers, there is a considerable quantity of tar and charcoal produced during the process, the value of which is esteemed equal to the expense of fuel.

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water furrows on wet lands; and also for the common purpose of ploughing stony clays when wet; the muzzle being set so as both horses may walk in the furrow.

5. Enclosing.

Gentlemen who pay particular attention to their hedges, never allow them to be cut with shears. In place of that implement, a hedge knife is used, with a short and slightly curved blade, thick in the middle, and tapering to a thin and very sharp edge on each side. By cutting always upwards, the twigs are cut clean over without being bruised or cankered, and the hedge is kept, of what is universally allowed to be the best shape, broad and bushy at the bottom, and contracting to a sharp ridge at top.

6. Arable Land.

Potatoes cultivated better than any other crop in the county, and with the greatest success. They are planted on every variety of soil, and thrive even on the stufiest clays where there is a sufficient declivity to carry off the surface water, but a gravelly loam suits them best: about twenty tons of manure per acre is the common dressing. Drilling and dibbling are the common modes in the lowlands, and by large beds in the uplands; average produce twelve tons, but eighteen are frequently obtained.

7. Grass Land.

Some bog meadows, but no others; some pasture fields around gentlemen's houses, but none on lowland farms; mountains wholly in natural pasture, moor, heath, bog, and moor.

8. Woods and Plantations.

Copewoods are a very important and prominent article in the produce of this county. They cover some thousands of acres of soil which would otherwise be altogether or nearly useless, and yield an income to the proprietors, little inferior to what they derive from their best arable land. The steep sloping banks of Loch Lomond and Loch Long, where the bases of the mountains run into the lake, are in many places covered with them. The thin dry soil which appears in small patches

7058. STIRLINGSHIRE. 450,560 acres, much diversified by rivers, mountains, woods, and valleys, containing some rich alluvial soil, extensive peat-bogs or mooses, and some bleak hilly districts. The culture of wheat and beans is the chief agricultural feature. Potatoes first cultivated in the fields in this county, by Prentice, a farming gardener, at Kilsyth. (*Belsche's General View*, 1796.)

Principal river the Forth, and mountain Benlomond; the latter a cone, upwards of 3263 feet high, of sheep-walk, belonging to the Duke of Montrose.

Lime, coal, ironstone, granite, whinstone, and freestone abundant.

The *curve lands* constitute one of the most remarkable soils in the county. They lie in a low situation on the banks of the Forth, and extend about thirty miles in length, and two in breadth, at an average. They are elevated from ten to twenty-five feet above high-water mark, and a small portion of them in some places is overlooked at times by the river. The soil is universally allowed to be the alluvion deposited by the Forth and its tributary streams, and consequently to be the spoils of the higher grounds, through which the river takes its course. It chiefly consists of a hazel-colored clay, a small quantity of sand, and a pretty large mixture of once organized matter. In some places are patches of till of various colors; but not a stone, so large as to obstruct the plough, is to be

found. The soil of the best quality, when dug first from the natural bed, is of a bright blue color, and of a substance resembling the richest soap, and sometimes even serves as a substitute for fuller's earth. In many places the clay is excellently fitted for making bricks, tiles, and a coarse kind of crockery ware. The depths are from five to fifty feet. The subsoils are various, as a stiff brick red, hard till, and gravel, in a natural state. These beds of shells are from a few inches to four yards in thickness; they are chiefly large oysters, with a mixture of cockles, whelks, and some other shells at present found in the frith. These lands are in farms from 15 to 100 acres each. In the higher parts of the county the extent is from 20 to 1000 acres.

(Of moors above 90,000 acres.)

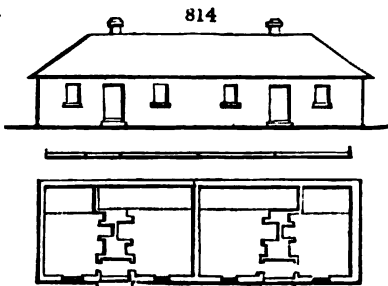
Coppice woods extensive, and plantations considerable.

Carron iron works of great extent, and well known. Large cattle fairs held at Falkirk. Chief commerce the shipping of Carron articles for London and other places.

7059. WEST LOTHIAN or LINLITHGOWSHIRE. 71,580 acres of gently varied surface, without hills or mountains; clayey soil, and rather cold and variable climate. The minerals are coal and lime in abundance; freestone, whinstone, and some lead and iron, but the latter are not now worked. The coal at Borrowstonness has been worked for upwards of five centuries. In an agricultural view, this county is of no interest. (*Trotter's General View*, 1811.)

Property is in the hands of about forty proprietors. Lord Stair is supposed to have introduced the culture of clover, turnips, and cabbages, at Newliston, in this county, as early as 1780; and also the Rotherham plough, for which purpose he sent a mechanic to England, to acquire the art of constructing them. A hay drag, of a very simple but convenient construction is used in this county. Plans of a more decent form of cottages (*fig. 814*) are given, than are to be found in some reports. Each cottage consists of two rooms (*a, b*); the one to be used as a kitchen has a space for two press or close beds (*c*), and in the other room there is a space for one bed (*d*); in each room is a cupboard (*e*), but no closet, which is a great defect.

The contrivance for making horses draw equally in threshing machines (2637), was invented in this county, by G. Henderson, of Bonbar. The culture pursued is the East Lothian husbandry on the clay, and the Berwickshire on the turnip soils. The chief commerce is from the port of Borrowstonness, and there is scarcely any manufacture, unless spinning, knitting, and tambouring, in private families may be named.



7060. CLACKMANNANSHIRE. 30,720 acres, principally of carse land, on the north bank of the river Forth; but partly of hilly district, belonging to the Ochills. (*Brakine's General View*, 1795.)

The carse lands are very fertile; but part of the hilly and moory district of little or no value. The agriculture is similar to that of Strathgairnshire. After the invention of the threshing machine, one of the first was erected at Kilbaggie, by George McKie, in 1781; it is now used by water. A curious source of manure is found in this county. The moss flasket down from Blair Drummond (4196), accumulates in the bays, and is mixed as deposited, by the sea weed driven on shore by the tide. This moss and weed is taken out and fermented with a

small proportion of stable dung; or the farmers spread it over their cattle yards, and it forms most excellent manure. Thus, what is a complete hindrance to improvement turns out to be a complete benefit. Adam, of Blair Adam, the son of the celebrated architect, is a complete hindrance to improvement. The 1760, no wheat was grown in this county, though it appears by old abbey rentals that wheat was paid as rent at Cambus Kenneth, as early as 1147. Now wheat enters into almost every rotation.

7061. KINROSS-SHIRE. 47,642 acres, of varied surface, but generally low. There are extensive moors and muirs, and not much rich soil. Their agriculture is mixed, and of no great interest. (*Ure's General View*, 1795.)

Lochleven occupies 5306 acres; three small streamlets run into it, and the difference between its highest and lowest surface, at different seasons, is three feet. The trout of this lake in high season; those of the river Leven larger, weighing five pounds and upwards.

Dr. Coventry, the learned Professor of Agriculture in the University of Edinburgh, possesses an estate in this county,

where he sets an example of knowledge, industry, and good management, to all his neighbors.

Adam, of Blair Adam, the son of the celebrated architect, the most extensive improver in the county; and draining, enclosing, and especially by planting larches, and building commodious cottages.

7062. FIFESHIRE. 322,560 acres, exhibiting almost every variety of surface and soil, from the mountain to the plain, and from gravel to moss. The climate is generally mild, owing to the surrounding waters; and what adds to the value of the county, both for culture and for the formation of country-seats, it is rather drier than that of other counties equally far north. The agriculture is mixed, and may be said to excel both in the corn and cattle department. The reverend reporter displays more than the usual share of adulatory phraseology for that "highly patriotic individual, Sir John Sinclair," our "gracious Sovereign," the Board of Agriculture and the Government, "chalking out to the people a path by which they may rise to opulence and consideration." (*Thomson's General View*, 1801.)

1. Geographical State and Circumstances.

Coal, lime, and the usual rocks abound; iron-stone and lead and copper ore abundant, but none worked. Nearer Burntisland, upon the shore, and also in some other parts of the county, there are quarries of hard stone, of a dark color, with the peculiar property of resisting the force of fire. It will endure for many years, without being wasted or broken, though exposed to the most intense heat. On this account it is used for the soles of ovens, and for the sides of chimney grates. Cappon and fire bricks manufactured of an excellent quality. (*Thomson's General View*, 1800.)

2. Property.

Estates moderate; largest, 8000*l.* a year.

3. Buildings.

Few counties so richly studded with noblemen and gentlemen's houses; about a hundred enumerated as deserving of notice. Many magnificent buildings in ruins. Religious houses, castles, and Falkland Palace. Farm-houses and cottages formerly very bad, now greatly improved, and superior to those in most counties.

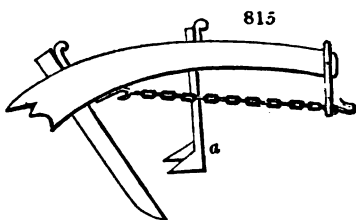
4. Occupation.

Farms from 50 to 800 acres of arable lands, and some of mountain pasture twice as large. Some of the largest and best farmers are men who have emigrated from other counties to this less improved district; but the greater number are sons of local farmers, and not a few farms have been in the same family for several generations. The reporter is an advocate for corn-rents, a mode first revived in this county with the improvement of not taking the corn, but paying in money, according to the average prices. Leases for nineteen years; some formerly for one or more repetitions of the period; in general the restrictions reasonable, for the managers of estates in this county are generally resident factors, and not Edinburgh lawyers.

5. Implements.

Ploughs with convex mould boards preferred for loose soils, especially when in a waste; they free themselves more readily of the earth, and make a deeper furrow. An addition to the

plough, called a rider, (*fig. 815 a*), adopted in some places, and found to clear away the stubble from the coulter.



6. Grass.

One-fifth of the county inaccessible to the plough, and in store sheep and cattle pasture; some bog or coarse rasey meadows on peat, and a few spots of good alluvial meadow.

7. Gardens and Orchards.

The remains of an orchard at Lindores, but none of modern formation. Some market-gardens near the towns, but most of the inhabitants have gardens of their own. Some good nurseries. Sung, an eminent nursery-man, and manager of gentlemen's plantations, — a valuable man to the county — has introduced an excellent system of planting, pruning, and draining. Some of the first private gardens in Scotland are in this county, as that of Keith, Wemyss Castle, &c.

8. Woods.

Not extensive, but young plantations very numerous and well managed. More cedars and rare sorts of trees in this county than in any other.

9. Live Stock.

Black cattle of *Fife* are distinguished. The reports has heard an English dealer say, that a *Fife* bullock of forty stone will bring an equal, and often a higher, price at the London market than an equal weight of any other breed, and equally fat. A good *Fife* cow will give from five to seven gallons of milk per day; from seven to nine pounds of butter, and from ten to twelve pounds of cheese per week, from weight, for some months after calving.

Breweries, distilleries, flour and barley mills, frequent. The linen manufacture extensive. Salt made from the sea. Tanneries, vitriol, &c.

The *Fife Farming Society* and the *Inverlochy Club*, supported chiefly by farmers, are considered useful institutions. The first was formed about six years ago, and at present consists of nearly 400 members. The principal objects aimed at by this institution are mutual communication of discoveries and improvements in husbandry; common protection against thieves and depredators who shall unjustly invade their property; and raising a joint stock or capital for the benefit of their widows and children, and of members reduced to distress or indigence. Members pay one guinea last their entry and half-a-guinea yearly. None are admitted but men of good

character; and such members as shall be found guilty of crimes and misdemeanors punishable by the laws of the land, are liable to expulsion, and a total deprivation of all benefit from the Society's fund. No member can draw any thing from the fund till it amounts to 500*l*.; nor can any one be entitled to any allowance, until five years after his admission. The allowance fixed for a member fallen into distress or indigence, is thirty shillings per quarter; but this allowance is granted upon the express condition, that he has not brought the distress upon himself by drunkenness, or any other kind of disorderly conduct. And during the time he is receiving the allowance, if he shall be found guilty of a dissolute or intemperate behavior, it is put in the power of the managers to deprive him of it. The widow of a member is allowed twenty-five shillings quarterly, so long only as she remains his widow, and maintains a good character. And the children, when no widow is left, are entitled to draw the half of what their father contributed. If a member shall die, and leave neither widow nor children, his next heir, or whoever shall be appointed by him, shall be entitled to the half of what he has contributed, after deducting a proportional share of the expenses incurred by the society since his entry. This society is, at present, in a very respectable and flourishing condition.

7663. PERTHSHIRE. 4,068,640 acres, almost every where mountainous, but with intervening valleys of strong clayey soils, fertile in corn; some gravelly tracts, and many mooses, bogs, and moors. The mountains on the southern side of the county, where they are less high, are covered with pasture to the summits; those in the northern parts with pasture, heath, and copse. The minerals are coal, lime, free-stone, slate, whinstone, granite, &c. the metallic ores, iron, lead, and copper, neither of which are at present worked. This county serves to divide that part of Scotland on the south, which is generally adapted to the raising of grain, from that of the north, which, with few exceptions, is more fitted for pasture. It also divides those parts of the kingdom on the north, where firs abounded in former times, and are still found in the mooses, from those in the south, which carried oaks and a variety of other wood, but no natural firs. It is also the general boundary, in regard to coal and granite, though both are found to a moderate extent, the former in the north, and the latter in the south. The husbandry of Perthshire is noted for its clay, or carse land culture, and for its plantations of larch trees. Its great improvers have been, or are, Lord Kaimes, the Duke of Athol, and Lord Bredalbane. (*Dr. Robertson's General View*, 1813.)

1. Property.

Estates are of all sizes, but the greater number large. The management of the great estates was uniformly committed in former times to the factor or chamberlain; but agriculture has become so much the amusement of the country gentlemen, since the middle of the last century, that many of the proprietors, besides the general superintendence of their estates, have a farm in their own possession, which they manage by an overseer. Many of our improvements in agriculture are suggested by the gentlemen of the army, in consequence of their remarks on the practice of other countries. The gentlemen of the law, during the recess of their courts of judicature, turn much of their attention to the cultivation of their estates; and their habits of application to the former study, quickens their ardor, and ensures their success in pursuit of the latter.

If the property be extensive, besides an overseer on the landlord's farm, there is generally a factor or steward, and sometimes two or more are appointed to manage the more distant parts of the estate. In these cases, unless the landlord have a turn for business, he is apt to lose sight of the detail of his own affairs; and if he be indolent, he has a good apology for neglecting his interest, because he pays another person for taking that charge off his hand. The prosperity of the estate, and the comfort of the tenants, depend in these cases very much on the disposition of the factor.

The boundaries of estates are marked according to the nature of the country. In the valleys of the Highlands, different properties are separated either by substantial stone-walls without mortar (provincially dry stone dykes), or by a river, or a brook, or a range of rocks, or some other natural limit. The lower hills too are generally bisected by these walls; but more generally by bounding stones, fixed in the ground, and set up singly; in other instances, if the stones be small, they are piled in heaps. The higher mountains are frequently divided in a similar manner, especially when different proprietors occupy the same side; but when they occupy different sides of the same mountain, the line of demarcation, as commonly happens between parallel glens, their properties are determined as wind and water divides, which means the line of partition on the top of the mountain between the windward and lee-side, or as it is still more nicely marked by the tendency of rain water, after it falls upon the ground.

A great proportion of this country is freehold. Many of the small proprietors hold of a subject superior. When a great baron in the feudal times had occasion to borrow money, he had recourse to wadsetts, or feued off a part of his property at a quit-rent, which was greater or less, according to the amount of the premium then paid in hand. The wadsetts are paid up; but the fees, being irredeemable, remain.

2. Occupation.

Arable farms from 30 to 500 acres. Farms in the mountains large, and their extent generally defined by miles. Leases seldom shorter than nineteen years endurance. Rent in a few instances, paid in money and partly in the money value of corn, on an average of two or three lay-gone years, according to the modern system. The culture requires scarcely any remark, since there are only two kinds of aration in Scotland, that of the clay soils of East Lothian, in which a fallow and alternate corn and green crops are introduced; and that of Berwickshire, which substitutes turnips for fallow, and allows from two to five years of pasture, according as the soil is weaker or stronger as resting crops. A full account of the clay land culture has been given by Donaldson. In the mountainous region, cattle chiefly, and sheep to a certain extent, are bred and sold for feeding in the low arable districts, and sent to the south of Scotland and England.

3. Gardens and Orchards.

In the Carse of Gowrie, a number (perhaps thirty) of orchards of apples and pears, the fruit of which is sold to the neighboring towns. A few other parts of the county adapted to open orchards, as the banks of the Tay, Earn, &c. In the valleys of the Highlands, geans and cherries abound. The trees thrive well, live long, and carry fruit of the finest flavor and most savory taste. The cream colored cherry of Ardvorlich, and

the black gean of Castlemenzies, are highly esteemed in respect of beauty and relish.

4. Woods and Plantations.

The Highlands of Scotland formerly covered with wood, as the trunks of oaks and firs in the mooses, from that of Moss-Hunders, near Stirling, to the bogs of Sutherland and Caithness, decidedly prove. Planting did not become general in Perthshire, till after the middle of the eighteenth century. The county is now distinguished by its extensive tracts of larch, common pine, and other trees, and by the enclosure of oak, birch, and hazel; copses and woods formerly left open to the browsing of deer and cattle. Different accounts are given of the introduction of the larch into this county. Dr. Robertson states it, as "said to be brought to Athol, from Carriola, by one of the Dukes of Argyll." According to others, the first plants were obtained from a nursery at Edinburgh, and planted at Dunkeld in 1741, having from previously introduced into Scotland, by Lord Kaimes, in 1734. (*Encyclopedia of Geography*, 7053.) Some of the first planted larches in the low grounds, near Dunkeld, have grown to the height of 120 feet in fifty years, which gives an average of two feet four and a quarter inches a year. It is stated by the Duke of Athol, in a communication to the Horticultural Society, made in June, 1820, that on mountainous tracts, at an elevation of 1500 to 1600 feet, the larch, at eighty years of age, has arrived at a size to produce six loads (300 cubic feet) of timber, appearing in durability and every other quality, to be likely to answer every purpose, both by sea and land. (*Hort. Trans.* iv. 416.)

"The largest larches in Perthshire are to be seen in several counties around it, are at Monzie, the seat of General Campbell, which measure five feet in diameter, and about fifteen in circumference. There are larches of a great size at Blair Drummond, Glenaege, Rosbie, and many other places in Perthshire. Posts of larch, which had been put into a moist soil about fifteen years ago, seemed still to be fresh and green. It is only of late that this tree has been generally planted, and its excellence known in this country. It is the most rapid in its growth of any tree we have, and the most valuable species of the pine. It is closer in the pores, has fewer knots, and the wood is more durable than the common pine, and whilst it increases double the number of cubic feet, in any given time; which is a singular property. It may vie in growth and profit with the Huntingdon willow, which has been said to buy the horse, before any other tree could buy the saddle."

There is a natural fir wood on the south side of Loch Rannoch which covers 2566 acres. One formerly belonging to the Bredalbane estate, but there are now only a few glennings.

There are more oak woods, and of greater value, in this county, than in all the rest of Scotland. The counties of Dunbarton, Argyll, and Stirling, come next to that of Perth. The copse of oak is cut once in twenty-five or twenty-six years. A few spare trees of the most promising appearance stand in the best figure are left at proper distances, from one cutting to another, and sometimes for three or four cuttings. The straightest, that crooked oak is more eagerly sought after by ship-builders, and brings a higher price than oak which is straight. Yet, as coppice wood is the object, straight trees injure it least. Scotch oak has been found in general too close in the grain to bend into planks for the sides of ships, and even for the same reason it is found to snap when used as ribs to a ship; its closeness in the grain is the effect of slow growth, owing to frequent checks by early and late frosts.

Before agricultural improvements were so well understood as they are of late, or occupied so much of the attention of all ranks in this country, many moorish tracts of land were deemed incapable of cultivation, or of making a return in any other way equal to their being planted. Proprietors, even in the Carse of Gowrie, and in the Stormont, being actuated by this principle, about thirty years ago, planted the waste lands of their estates with Scotch firs. They have now found that this soil, by being wrought, will make good arable land, and will be more profitably employed in tillage. Some thousands of acres have accordingly been cleared; the plantations

reared up; and the soil subjected to the plough, which now lets at a progressive rent. In some cases amounting already to twenty shillings the acre. Helvetius Coupar, Angus, and Perth, a tract of thirteen miles, the plantations on two thousand acres, upon both sides of the public road, have been grubbed up; and the operation on both sides has been continued in other places. So powerful is the principle of imitation, that we all go frequently one way until we have gone too far. All men can imitate example, but all men cannot reason so far as to form a principle of action to themselves. In a certain degree this operation is salutary, but if carried to excess, it will leave the face of the country naked; and, perhaps, in all cases, the cost is not counted, nor the balance fairly stated between the plantation and the produce arising from some poor soils by an arable system; yet it must be admitted, that no trees are equal in value to corn and grass, either to the landlord or the public, where the cultivation of these can be prosecuted with success.

5. Wastes.

The mosses and moors of this county are very extensive, and great and successful efforts have been made for their improvement. The most remarkable is that of Kincardine moss, commenced by the late Lord Kinnaird, and already described (1196.). Draining, paring and burning, irrigating, embanking, and all the different modes of improving land, have been practised; and some, as draining and burning, to a very considerable extent.

6. Live Stock.

Breeds of cattle very various; none peculiar to the county; Angus, Fife, and Argyll herds, common among the farmers; English, Ayrshire, and most of the approved breeds of the south tried by the proprietors. Breeding is the chief object, and next the butter dairy.

Sheep. The ancient breed of sheep in this county were the white faced. They were few in number, compared to the flock at present; and in the Highlands were housed in cots every night in winter and spring. About forty years ago, the black-faced or mountain breed was introduced from the south, and

7064. ANGUS or FORFARSHIRE. 532,943 acres, one half, or more, of clayey and alluvial lowlands, and the remainder mountain pasture, moor and bog. The climate cold, moist, and variable. It is both an agricultural and manufacturing county, and in respect to antiquities, facilities of further improvement, natural productions, &c. of great interest. The botanic family of Don, are of this county. A most valuable report has been furnished by the Rev. James Headrick, and is the last of the Scotch reports which has been published. (*Headrick's General View*, 1813.)

II. Geographical State and Circumstances.

The *Grimpen mountains* abound in granite, which contains topazes, or rock crystals. Quartz, mica, iron ore, stone, lead, limestone, slate, jasper, porphyry, breccia, and shell marl occur in various places. The Loch of Forfar abounds with shell marl, which is taken out by scoops, and thrown into boats, by which it is conveyed to the shore. The scoop consists of a large iron scraper, somewhat similar to the Dutch hoe, which has a long wooden handle fastened into a bag or strong leather fastened by whip-cord around its rim. The bag is perforated by small holes, to allow the water to drain off, and has a thong at its bottom, by which it can be turned over, and its contents discharged into the boat. After the boat is firmly fastened by anchors, extended from each end, one man forcibly presses down the scoop to the bottom, by means of a long pole, at the stern of the boat, while another man, by means of a windlass, or wheel and axle, fixed in the opposite end of the boat, drags the scoop along the side of the boat, by a rope attached to it, and then raises it up to the boat's side, where the contents of the bag are emptied into the boat. When the bag has received her load, the marl is thrown out upon a wooden platform at the side of the loch, to drain.

Sandstone flags are very abundant in the neighborhood of Arbroath, and are quarried and exported in great quantities. Principal quarry, Carmyle; the flags rise from three to six inches of any bed of sandstone, mica, or slate stone. The flags, but are in fact sandstone in plates, covered with scales of mica or tick, of a greyish blue color, and this mica occasions their easy separation from each other. With very thin plates, called *slatstones*, houses are covered; and they are laid in "plaster lime" or moss (*Sphagnum pulvirens*), but they seldom make a roof that is water tight, and slate is now considered cheaper. A most valuable property of the flagstone is, that when laid as pavement on wet soil, they never show this on their upper surface, so that they are excellent for paving kitchens, passages, paths in hot-houses, &c. Coal searching for, at the time the report was printing, but with no great hopes of success, the district being considered the boundary of the known coal fields of Scotland. No minerals worked: various chalybeate springs. No rivers, but a number of streams that are of moderate size. Considerable sea, and some salmon fisheries. The herring fishery has been tried in the open sea, and considerable quantities taken in June, July, and August. Those catches taken were plump and fine, which shows that all former theories concerning this most nutritive and abundant of all fishes, are erroneous, and how much it imports the interest of Britain, that the herring fishery should be conducted according to the Dutch method, in the deep sea, and, as in the Isle of Man, from May to September. Grilley or sprats, and sprilings or smelts, though in the Frith of Tay. The sprats resemble herrings, though of smaller size, and different flavor. They are taken in great quantities at Kincardine, and other places near the junction of the Forth with its estuary, by nets or wicker traps, sunk in the ebb of the tide. The smelts are smaller than the sprats, but are as fresh, emit a smell resembling that of green rushes; but when fried, make a delicious food. They are caught during spring, along the Forth, often as far up as the Bridge of Stirling, by nets in the form of baskets, fastened to the end of long poles.

Haddock, whiting, &c. cured by smoke, a practice first suggested by Headrick, in an essay published by the Highland Society of Scotland. Dempster, of Dunnichen, in this county, first suggested the idea of conveying salmon to London, packed in ice. Reporter remembers when servants in the neighborhood of Stirling used to stipulate that they should not have salmon oftener than thrice a week; now they seldom have them once a year.

Every river is said to have its particular breed of salmon. They

bought in, either when lambs, or at a year old. Their numbers have increased beyond all expectation, since that time, over the whole Highlands of Scotland. In gentlemen's enclosures, we see different kinds, according to their fancy, or the superior price expected from one kind more than others.

Horses. The original breed were of a size to drive to thirteen hands high, and too light for two-horse ploughs. Four of them were used abreast, as is still the case in some remote places. In the Carse of Gowrie and other lowland districts, oxen were employed to draw the plough, till about 1779; and the horses were only employed to harness in the soil, to carry out the dung, and bring home the corn to the stack-yard. (Oxen discharged from the plough, it became necessary to purchase larger horses than were then bred in the county; and the markets of Glasgow, Falkirk, Stirling, and Perth, were resorted to for that purpose; which practice still continues.)

At present some Northumberland stallions have been procured by proprietors, and lent to their tenants in order to raise an improved breed.

Swine. The prejudice against swine's flesh was such, that not many years ago no Highlander would touch it; that is now fast wearing off, and the culture of swine extending.

There is a *rabbit warren* at Dunkeld, and red deer and roes in one or two places. There are also three or more kinds of fallow deer in the county.

Bees much attended to, and found profitable. Paterson of Castle Huntly uses mignonette for his bees, which gives the honey a most delicate flavor. Rosemary does the same. The honey of bees is pale; the honey of heath brown. Their flavor is also different.

7. Political Economy.

Roads wretched before 1745; still only bridle roads in many places of the interior. No canals; salmon fishery to a great extent on the Tay. Linen manufacture, bleaching, and various other manufactures and public works. The principal salmon fishery is rented by Richardson for different periods, and for the sum of 7000*l.* a year. There are five others, which produce from 100 to 200*l.* a year.

have recourse to fresh water, to escape the attacks of seals, otters, and porpoises, and to get rid of the sea-lice, a small black animal whose attacks are very painful, and occasioning tortures. A few gulps of river water, seem either to kill the sea-lice, or to deaden the pain it inflicts. Salmon never remain longer in fresh water than is necessary to effect the purposes which brought them there; but sometimes they are surprised in the rivers by long droughts, and cannot get over mill-dams, and other obstructions which lie between them and the sea. When this happens, they soon get lean and mangy, and die, their bodies covered with white worms. But in fresh water, they take various kinds of bait, and eagerly catch at flies, and hence become a source of amusement to the angler. During autumn, the salmon always run up the rivers to deposit their spawn.

The spawning of salmon seems to be a very slow and laborious process; and they get very lean, and even become unwholesome food, while they are engaged in it. The scene of this operation is generally where a stream begins to issue from a stagnant pool, over a sandy bottom. The fish, by digging a hole in the bottom, by pushing the sand and gravel before them with their snouts, in the direction of the current until they raise it into the form of a bank, which checks the rapidity of the current, while it allows the water to percolate slowly. The male seems to exert himself most in this work; and before the eggs are deposited in the sand, he has thrown out more than usual, while before it is finished, it is often worn entirely away. While depositing their spawn, the male and female rub their bellies upon each other; the latter throwing out her roes, or eggs, while the male emits among them a milky juice, which seems to effect their impregnation. After one stratum of eggs is deposited in the sand, the female comes and covers them with light sand, to prevent them from being washed away by the water; and thus they form alternate layers of eggs and sand, until the hollow is nearly filled up. The eggs being dropped into a hollow place, are warmed into life by the sun's rays, in early spring. The fry being then very small, easily escape from their covering of loose sand, and soon acquire the size of small trout, and are called salmon fry, or smolts; which seems to be a contraction of *semlets*. The first flood now washes them into the sea; and they are generally swept from our rivers before the middle of May.

Salmon trout, or grilley, which ascend the rivers toward the close of the fishing season, are sometimes considered a distinct species of fish; but some Calthness fishers assured the reporter, that they proved by experiment, that grilley are only salmon of one year's growth. (*Rep.* p. 103.)

The *sea trout* resembles the salmon, and frequents all the streams where it abounds.

Fresh water eels, contrary to the practice of salmon, breed in the sea, and thrive and fatten in the fresh water lakes and ponds. During summer, myriads of their young fry are seen constantly ascending the fresh water streams, where they keep near the sides, that they may avoid the current. In places where the water is shallow, such as in the Forth, they frequently make their way up the crevices of the building, or over the dry land, until they reach the stream above, in which they continue their course. The larger eels are caught in this country, while they are descending the streams during autumn, probably to deposit their spawn in the sea.

The observations of the reporter on various other species of fish, and on salmon, and other fisheries, are, like every thing, which flows from his pen, new and interesting.

2. Property.

Much divided, largest estate 12,000*l.* a year; property at an average, changes its proprietor every forty years. During the dark night of superstition, a man could not see his possession

his property, or his domestic concerns, without having half a dozen, or a score of priests to advise him: and he was obliged to compound for the safety of his soul, and the security of his property, by ample donations to the church. When a man died without granting these donations, it was presumed to be his intention to do so; and that was originally an alms, or favor, was claimed as a right. In our days, a man can hardly venture upon any step of impotence, without having a posse of lawyers at his elbow, and after all, often finds himself as far from his purpose as if he had not employed them.

3. Buildings.

Sixty gentlemen's seats enumerated: not many with handsome buildings. Farm-houses and cottages most wretched, and slower of improvement than in most other counties.

4. Occupation.

Farms of all sizes, but chiefly small. On the Grampians, estimated by the number of sheep they will maintain.

5. Implements.

Old Scotch plough still used in a few remote places, and found an instrument well adapted for breaking up waste land that is encumbered with the roots of shrubs, or with stones. At no remote period, it was usual to yoke four or six horses abreast in this plough. The driver walked backwards before the horses, and struck them in the face to make them come forward. At present the plough is commonly drawn by four, sometimes by six horses, which are yoked in pairs, and the driver walks beside them. But, excepting for the purposes already specified, the plough which was first invented by the late Small, near Dalkeith, and from him named Small's plough, is universally used.

A *thrashing machine* of a very peculiar construction, adapted to very high falls of water, erected at Howmair, by Stirling, an ingenious man; but is not yet perfected, and if it were, could never become general.

A *pick or lever* with a tread, used in the same manner as a fork or spade, for loosening hard earth or gravel: in fact it may be called a one pronged fork.

6. Tillage.

Following general. Seed-wheat washed with a ley of soft soap, to remove the smut. Potatoes introduced to the gardens in 1745, but not to the fields for many years afterwards. The late Dr. Walker, Professor of Natural History in the University of Edinburgh, was in the habit, especially during years of scarcity, of using vases in place of bread in his own family. He cut them into thin slices, and either branched them on the fire, or dressed them in the frying-pan with as much butter as prevented the pan from burning. When dressed in this way, their taste was very pleasant; and they were used in all cases where bread is commonly used.

7. Gardens and Orchards.

A great prejudice in favor of covering wall trees with

nets, to preserve the blossoms from the frost: woollen nets preferred.

8. Woods and Plantations.

Few woods, but many plantations. In the mosses the trunks of large trees found.

9. Rural Economy.

Farm-servants live chiefly on oatmeal, and potatoes and milk. Their breakfast is porridge, which is made by stirring meal among boiling water, or milk, in a pot over the fire, with a little salt; and when it cools it is eaten with milk. Or they use *brose*, which is made by pouring warm water upon meal, in a wooden dish, with a little salt, taking care to stir it well. This also is eaten with milk, or with beer, which is furnished in the place of milk, when the latter is scarce. Sometimes, when they are in a hurry, they mix the liquid with the meal, in a cold state. Their usual dinner is oat cake, with sometimes butter or skimmed milk cheese, and milk. Their supper is the same with breakfast, except that sometimes they use *sowens*, or potatoes, in the place of porridge or brose. Butcher's meat is only used on particular occasions; and fish by those who are near the rivers and the sea coast.

Much ridicule has been thrown on the Scotch, on account of their immediate use of oat-meal. This has been repeated as inflaming their blood, and producing their favorite disease called the *Scotch Piddle*, and other cutaneous eruptions. But oatmeal is as much used in some districts of England, as in any part of Scotland; and cutaneous eruptions are much more frequent in some of these districts than they are here, where they are seldom or ever heard of. The latter ought rather to be ascribed to dirty linen or clothing, than to oat-meal, or any particular species of food. Oatmeal, when it is sufficiently diluted with any sort of liquid, is known to be a laxative aperient, wholesome, and at the same time a strengthening food for those engaged in hard labor. Engineers, who superintend the excavation of canals, have assured the reporter, that those laborers who lived entirely upon oatmeal and milk, did a third more work than those who used butcher-meat, beer, and spirits. All of the former saved money, while many of the latter involved themselves in debt. As this sort of work is done by the piece, it affords a fair comparison, not only of the wholesomeness of oatmeal in promoting health, but of its power in supplying labor.

All families that have a house of their own, use tea and wheaten bread. But among cottagers this is a rare, and always a ceremonious entertainment, at christening and other solemn occasions.

Several agricultural societies: the first founded by Dempster of Dunnichen, an eminent improver. An account of the native plants and animals of the county by Don, the celebrated Scotch botanist, who resided at Fofar, possesses great interest for the naturalist. Indeed, the whole survey ranks, in this respect, with that of Farcy of Derbyshire.

7065. KINCARDINESHIRE or MEARNS. 243,444 acres chiefly of mountain, but containing about one-third of culturable surface. The climate is gravelly, mossy, or clayey, and scarcely any where naturally fertile. The only minerals are lime, found in a few parts, and granite, whin, and freestone. Improvements commenced in this county about the middle of the eighteenth century, and have since been carried on with great spirit. (*Robertson's General View*, 1795.)

1. Property.

—In few hands: largest estate 40,715 acres, the rest in eighty or ninety estates.

2. Buildings.

Some old farm-houses still remain, built of stone and turf, and in all respects wretched; but as leases are renewed, new farmhouses are erected on the most improved plans, with commodious dwelling-houses. So much cannot be said of the cottages, which have undergone very little alteration in structure, for a long tract of time. The habitation of the farmer may have advanced in elegance and accommodation a hundred fold; but the cottager still lives in the same simple kind of fabric as his ancestor did in the most remote ages of civilization. A cottage built of stone and turf, or more generally of stone and clay, commonly contains, like the ancient farm-house, of two apartments divided by the furniture. In each of these there is a fire-place and a window. The fire is still without a grate; but the window has two, and in some cases four, panes of glass. The house may be about thirty feet in length, and twelve feet (seldom more) in breadth, in the inside. The walls never exceed six feet in height; and the roof is covered first with thin sods, and next with thatch, carefully renewed from time to time, and tied firmly on with straw ropes. The whole has much the appearance of a low hay-stack. Every cottager has a little garden or hall-yard. And many of them bestow much care, and show no little taste in its cultivation. Besides raising different kinds of cabbages, cabbages, onions, carrots, &c. for the pot, they frequently have of gooseberry and currant bushes, together with roses and other flowering shrubs. Some of them decorate the walls of their houses with honeysuckles, or with ivy; and in some instances with cherry and apple trees.

The furniture of a Mearns cottage consists, in general, of two close wooden beds, which are so arranged as to make a separation between two apartments; one or two wooden chests for holding clothes; a cask for holding meal; a set of dally utensils; an iron pot or two for cooking the victuals; a gridle, or heating iron, for toasting the bread; and a few dishes, some of wood and some of stone ware. Two or three chairs or stools, and a press or cupboard for holding the crockery ware, and the bread, the cheese, the butter, and, at times, the whisky bottle. A tea equipage, on a small scale, has also of late become an indispensable article of cottage furniture;

for tea drinking has now found its way every where. It seems to be a gentle species of ebriety, which sets the imagination and the tongue at work, without incurring the imputation of drunkenness, or breaking any one precept, human or divine. Wherever it is once introduced, it keeps its ground as certainly as snuff or tobacco, and becomes nearly as inveterate a habit; but happily it serves as an article of food, at the same time that it is a luxurious gratification. The value of a cottage furniture may be estimated at from ten to twenty pounds.

The cottagers are moderate and plain in their food, but they are not so in their clothing. Hardly any thing but English manufacture will serve them. At Kirk and at market, it is difficult to distinguish the man from the master, and still more so, the maid servant from her mistress. Either the one or the other have seldom less than five pounds worth of clothes, and often twice that value, on their back at once.

The village of Laurence-kirk was founded by the late Lord Gardenstone, about 1760, and in 1781 he procured a charter by which it was declared a burgh of barony. There is an excellent inn here, with a library and museum for the use of the traveller. There is a manufactory of sycamore snuff-boxes; and the lands in the neighborhood have been raised in value from ten shillings to three and four pounds per acre.

3. Occupation.

Arable farms of various sizes: many small; some 400 or 500 acres. All pastures lie in tracts by the thousand acres. One farm occupies 30,000 acres. Leases formerly let on periods of two, three, and four times nineteen years, with sometimes a life-rent after; of late the term seldom exceeds nineteen or twenty years, unless when great improvements are expected to be made by the tenants. The arable land is cultivated under judicious rotations, in which either turnips or fallow enters, according as the soil is light or clayey. The mountains are devoted to the breeding of cattle. There are few or no public gardens or orchards, but great extent of young plantations, and some patches of native birch and hazel copse. The cattle are a small, hardy, kindly feeding breed. The horses of the Clydesdale variety are reared by many farmers, and most kinds of improved stock have been tried. Bees are generally kept. There is a good deal of sea fishing, and some valuable salmon fisheries; but excepting ropes, nets, canvass, &c. there are no manufactures of any consequence.

7066. ABERDEENSHIRE. 1,970,744 acres, one-sixteenth of Scotland, and one-fiftieth of the area of Great Britain. The surface for the greater part not very irregular, but hilly and mountainous in the district adjoining Inverness-shire: the soil in general clayey and moory; the climate milder in winter than that of Middlesex, owing to the circumambient sea, but the summers short and cold; the agriculture assiduously pursued, and the products chiefly corn and cattle; — great part planted with trees. The report of the county is more than usually intelligent, and contains two preliminary sections, on the lessons which other counties may derive from Aberdeenshire, and on the improvements which this county may derive from others. Aberdeen exhibits a successful example of spade and plough culture combined, in the small holdings of tradesmen, mechanics, cow-keepers and gardeners: and may profit from other counties

southwards, by greater attention to collecting manure, not employing women and children in the lighter operations of husbandry, and limiting tenants to a certain number of subtenants. The celebrated Dr. James Anderson, farmed extensively in this county, at Mounie, now the property of his eldest son, Alexander Anderson Seaton, a distinguished horticulturist. (*Keith's General View*, 1811.)

1. *Geographical State and Circumstances.*

No metals, or coal, and very little limestone, but abundance of excellent granite; which is used for every sort of building at home, and exported to London in great quantities. Besides the durability, there is one other excellence attending the use of this stone; the expense of carving it has simplified the style of architecture.

2. *Property.*

Much divided, only two or three large estates. Lord Aberdeen's most valuable, consists of 50,000 arable acres, and 25,000 waste.

3. *Buildings.*

A number of ancient castles and religious buildings, and a few handsome modern houses. An ample descriptive list of gentlemen's seats, which are very numerous. Farm-houses, formerly decayed structures of clay, turf, and thatch, are now greatly improved; cottages improving. "*Decent farm-houses*" first began to be thought of about 1760. In 1794, Dr. Anderson observes in his report of the county on which the present one is founded, that they are "for the most part very poor. This is," he adds, "highly impolitic. Nothing contributes more to the content and convenience of a farmer, than good and well disposed buildings. It elevates his mind, gives him spirit to pursue his operations with alacrity, and contributes in many instances to augment his profits. I never yet saw a thriving tenant who had not good houses. But on no account should he be induced to expend that stock upon building houses, which should be employed in extending his own proper business. It ought always to be done by the landlord; and, in general, a good set of houses upon a farm, will bring him much greater additional rent than the interest of the money expended upon them. Nothing will prove such an allurement as good buildings, and long leases on equitable terms." Since 1794, when Dr. Anderson wrote the above paragraph, we have got farmers from Berwickshire, Angus, Fife, and other southern districts, who have taken farms in Aberdeenshire, and many of whom have shown excellent examples in agriculture, as well as improved their own capital; and the native farmers of the county, in consequence of their example, both in asking good houses, and in raising good crops, are now in a much more flourishing situation.

4. *Occupation.*

The greatest diversity in the size of farms; from six acres to thousands; scarcely a mechanic, journeyman or master, who has not a farm of one acre or two, or a garden; besides the produce, they find the labor highly conducive to health, by counteracting the effect of indoor confinement, and prolonged unobedient bodily postures, or contaminating respiration.

5. *Implement.*

Turnips formerly sown from a small tin box, nine inches long, and one inch square, with two or three holes at one end, through which the operator shook out the seeds: thinned by a part of the blade of an old scythe fastened to a bit of iron like a common hoe; the advantages of the latter are its sharpness, but it is easily broke. A child's cradle rocked by water.

6. *Enclosures.*

Stone fences, or ditches and earthen banks, the common fences: this frees the land from loose stones, which abound every where, or serves to drain it.

7. *Arable Land.*

Potatoes, as well as various other improvements, first introduced to field culture after the calamitous year, 1782: not liked by farmers so well the turnip. The reporter tried various experiments in distilling from potatoes, which are recorded in the *Farmers Magazine*. Yellow turnips very much sown, and generally preferred by the cow-keepers. Ruta baga in great repute, but requires to be earlier sown than the yellow, and consequently does not admit of so thoroughly cleaning the ground. Carrot, beet, scorzonera, and other roots fermented and distilled by the same method, the best spirit and greatest quantity from carrot. White beet grown, but found to yield less produce than turnip, carrot, or cabbage.

8. *Gardens and Orchards.*

The county of Aberdeen is distinguished beyond any other county in the island, for the preparatory branch of all good gardening, viz., *trenching the soil to a proper depth*. We have a numerous class of gardeners in the vicinity of Aberdeen, who cultivate the lands in the neighborhood of that city, and whose practice deserves to be generally known, and generally imitated.

They, in fact, are kitchen gardeners, seedmen, and nurserymen. They raise all sorts of roots for the inhabitants of the cities of New and Old Aberdeen, various seeds for the use of the country at large, and nurseries so extensive, and so carefully managed, that, besides serving the landed proprietors in the county, and the owners of villas near the towns, they export considerable numbers of plants to England. One of Ferguson of Pitfour, of ten acres. The site of it, nearly 600 years ago, contained the Abbey of Deer, founded in 1218, and the garden belonging to the monastery. It is a striking proof of the luxury of the Roman clergy, and of their uncommon skill in the raising of fruit-trees. The ten Ferguson was laying out his new orchard, he found in the Abbey garden, first, rich soil,

above three feet deep; secondly, a well-paved causeway of granite; thirdly, a bed of pure sand, one foot deep; fourthly, another causeway of granite; and below the whole, a considerable depth of rich mould. No greater precaution could have been taken to render the roots of the trees from being injured, by piercing into a cold or wet subsoil.

9. *Woods and Plantations.*

In the higher division of Mar, occupy nearly 100 square miles, in some places very thickly planted, and in others raised by nature, at very different distances between the trees. Nearly one-third has been both enclosed and planted; one-third has been raised by nature, without either enclosing or planting the ground; and the remainder has been surrounded by fences for keeping out the cattle, and then been stocked with wood, raised from seed, either blown by the wind, or carried by the rooks, who, by some instinctive impulse, carry the cones of the Scotch pine in their bills, to provide habitations for their offspring, at a remote period, when the seeds contained in these cones become trees, in which they may build their nests. In these higher districts, wood grows so easily, that the proprietor need only enclose an extent of hilly ground, and thus shut out the cattle. The wind and the crows will in time supply him with seeds. But when these natural woods grow very irregularly, it is found prudent to assist nature, by sowing, or occasionally scratching into the soil, a number of seeds of the trees which are wished to be reared in the vacant spaces. The greater proportion of these woods consists of Scotch pine, it grows slowly at first, but is very valuable. Where the soil is barren, and the trees grow very slowly, the quality of the Scotch pine is of the best quality. A remarkable tree, at Invercauld, was cut down about forty years ago; and the number of concentric circles near its root, viz. 229, showed it to have grown and increased in size for 229 years, besides the time that it continued stationary. Its wood was declared by all who saw it, to be the best quality of Scotch pine to say that it had ever been imported from the north of Europe. There are thousands of pine trees in Braemar, some of which are nearly six feet in diameter, which are superior in point of quality to any wood of that denomination that was ever imported into any place in Great Britain.

10. *Improvements.*

Trenching has been already mentioned: within three miles of Aberdeen, above 3000 acres trenched; some acres paid 50l. per acre, for granite boulders for exportation. Practice of trenching very general throughout the county.

Irrigation adopted on poor iron-stone clay, not worth 20 shillings per acre, but raised in value to two pounds. The operator brought from Gloucester, by Ferguson, of Pitfour.

11. *Live Stock.*

Mettie bred than in any other county. Scotch cattle first improved by crossing some English cows sent down by Henry VII. to his eldest daughter, Queen of James IV. The produce was known as the Falkland breed. Williamson's three brothers sell annually about 8000 head of cattle of various breeds, in the south-county markets. They decidedly prefer the native, unimproved, to the improved, and are equal to the mixture of the Falkland, or Fifehire breed, with that of this county; and consider both these to be much superior to the English, or to any foreign breeds. They justly remark, that the food, or keep should be always above the breed, and not the breed above the keep. They consider the small high-land cattle, which are generally bred, as the best, as they are too restless and impatient for feeding well. They prefer the native low country breed to the larger ones, as they are most easily maintained, more hardy in work, have flesh of the finest grain, and pay better in proportion to the goodness of their keep. Every succeeding generation, for the last thirty years, has increased in size, and that, by good keeping; the native breed is double its former size (i.e. weighs at least double its former weight), since the introduction of the turnip husbandry. They are also decidedly of opinion, that wherever a landed proprietor breeds more than one year for family use, the stock should not be tied up, but allowed to graze, in order to get gentle exercise along with his food, that the second year he may be put to high feeding, and be tied up, and may be continued with this high feeding as long as he seems to thrive; but that he ought to be killed whenever he loaths his food, or appears to be sickly, or not thriving.

The sheep few, and of a mixed breed. Horses are native ponies, or purchased from Clydesdale. Poultry very common; great demand for eggs, both for the Aberdeen and London markets. Red deer in great numbers in Braemar, and roes in the hills of Cromar.

12. *Manufactures.*

County long celebrated for its woollen manufactures. About 1600 Garden, of Gilcomston, a wealthy sheep farmer and manufacturer, had a daughter, who married Lieutenant Cadogan of Cromwell's army; who afterwards was made a peer, and from whom sprang the Dukes of Richmond and Leicester, Lords Cadogan, Verney, Holland, C. J. Fox, and other eminent English families.

Woollen, linen, and cotton, now extensively manufactured. Knitting of stockings and spinning list formerly common, but little attended to since the introduction of machinery.

7067. NAIRNESHIRE and MORAYSHIRE. Forming together 512,000 acres of mountainous surface, and some narrow arable vales, are included in one survey. The climate along the Moray Frith has always been noted for its mildness, which is partly owing to its localities, and partly to the general prevalence of a dry sandy soil. On the mountains the climate is more severe. Lead, iron, lime, marl, freestone, slate, &c. are found, but the two first are not worked at all, and of the others, only the freestone, to any extent. (*Liter's General View*, 1810.)

1. *Property.*

In very large estates, as for example, those of the Duke of Gordon, and Duke of Findlater, Moray, Fife, and Lord Cardor.

2. *Buildings.*

Considerable as has been the alterations in the houses of proprietors, it is nothing to that which has taken place in those

of farmers. Prior to the year 1760, in the dwellings of tenants there were neither floors, ceilings, nor chimneys. In a few of them, the low wall was rudely raised of stone, and clay mortar, and a small glass window; in one only of the dwellings, as in the most artless manner; a loft, on which the roof rested without

any side wall, distinguished a very few of the most respectable habitations. There was, in general, but one fire (which served all domestic occasions) in the apartment, where the servants and master, with his wife and maiden daughters, lived and fed together. In the higher parts of the district masters were much worse. Now upon every farm of any consideration, the buildings are substantial, commodious, and neat.

3. Occupation.

As in Kincardineshire; but the arable lands being generally light, the turnip husbandry is more prevalent. It is a singular fact, that in an island in a lake, Loughnadrury, in this county, the turnip is found more plentifully in a wild state than any where else in Britain. This island contains a forest, and the reporter conjectures that turnips being introduced at an early period from the continent, the small plot of ground within the walls could not be occupied by any crop more convenient for its temporary inhabitants, than that of turnips and coleworts. It may be conjectured that the last crop, probably sown from 300 to 400 years ago, had never been gathered. Until of late the turnips in this island sprung up annually in a thick bed, without culture. The root, in some favored situations, it is said, had been found of one pound weight, but they resemble in general the wild kind, having a long root, like a carrot, and of rich juice, with a rough pointed leaf. Some plants of red cabbage were also distinguished among them. Both were used as pot herbs at the tables of the country people, on which account they were sometimes raised in their gardens. When they began to run to

seed on this island, young cattle were ferried in to feed on them. The Rev. Francis Forbes, minister of Grange, has seen rentals of the family of Craigvar, from which it appears that turnips were paid as an article of rent, in the end of the seventeenth century. The quantity (about 300 bushels) shows that they must have been applied as food for cattle. By the famine which unfortunately took place at that period, however, every agricultural branch of industry was so deranged, that this important object, instead of being extended, was, even there, wholly abandoned.

The cultivation of turnips, as a food for cattle, was first introduced into this county, from the county of Norfolk, by the late Earl of Findlater, about the year 1760.

When the artificial grasses and herbage plants were introduced, only regular gardeners were employed to sow them; now common country operatives perform the operation. Few orchards, and apples imported from England; a few natural woods, and extensive artificial plantations. In general it may be observed that in this as in the other counties of the North, every description of improvement has been tried, and such as are found to answer, as draining, burning, irrigation, planting, road making, &c. carried to a great extent. All the improved implements have been tried, and the reporter even proposes an addition to them, in the form of circular saws, the circle of cast iron, and the times of wrought iron, screwed in or fastened with nuts and screws. (See fig. 776.) There is a good deal of fishing carried on along the coast and in the Moray Frith.

7068. The shires of ROSS, NAIRN, and CROMARTY, are three adjoining mountainous districts, containing 2,204,800 acres. The soil is in general light, sandy, or peaty. Minerals of various kinds have been found, but only building stones and lime are worked. (MacKenzie's General View, 1810.)

1. Property.

Is in few hands, and till of late underwent but few changes. There are no sources of information from which a precise knowledge of the state of agriculture in these and other northern counties, previous to the rebellion in the year 1745, can be derived; but from what it has been since that time, until about 1760, it may safely be concluded, that agricultural knowledge was neither sought for nor desired. The mode of management which has been practised in these counties, and in other parts of the Highlands, and which has been handed down from father to son for many generations, is still to be found in the midst of the most improved districts. We still see the arable land divided into small crofts, and many of the hills occupied as commons. On the west coast, particularly, the ground is seen covered with heaps of stones, and large quantities are collected on the divisions between the fields, so that a considerable portion of the land capable of cultivation, is thus rendered useless by the indulgence of the most unproductive sloth. The management of the native farmers is most destructive. The soil of one field is dug away to be laid upon another; and crop succeeds crop, until the land refuses to yield any thing. It is then allowed to rest for a season, and the waste of time to multiply. Such, we must suppose, was the system of farming before the rebellion; we cannot imagine it to have been worse.

2. Buildings.

The old Highland tenantry are universally ill accommodated. They live in the midst of filth and smoke; that is their choice. But wherever farms have been laid out on a proper scale, and have been inhabited by substantial and well educated men, we find the farm-houses and offices handsome and commodious. Every proprietor who wishes to see his estate rapidly improved, will erect suitable buildings at his own expense, before he invites a good tenant to settle upon it. The interest of his money will be always cheerfully paid, and if the

landlord agrees that the repairs shall be made at the mutual expense of himself and his tenant, the latter will thrive, and the former will never have to demand his rent twice. The present race of Highland tenants will yet find themselves much happier, and more comfortable in their present situation, than substantial tenants, than in their present situation. The dwellings of cottagers are not worse than those of the native farmers. The same roof covers men, women, children, cattle, dogs, pigs, poultry, &c. It must afford great pleasure to every lover of his country, to observe the neat cottages that are erecting in every part of the country; but it will be long ere the people will learn the comforts of cleanliness and the use of chimneys. In many places where these have been constructed, the people do not use them, but prefer breaking a hole in the roof of the house, and lighting their fire on the floor. Smoke they say keeps them warm.

The occupation and management of land is the same as in other mountain districts. Some grain, chiefly oats, is raised in the low grounds, with root and herbage crops, and the pastures are devoted to the breeding of cattle and sheep. Every improvement is tried by the principal proprietors; and enlightened farmers from the south of Scotland, and accustomed to breeding, induced to settle on their estates, by low leases and moderate rents. From these the smaller native farmers take an example sooner than they would from the operations of proprietors, which they are apt to consider, as at least of dubious value. When a rent-paying farmer, however, adopts plans new to the case he is very different. Of woods in this district there are very few, but many plantations have been lately made round gentlemen's seats, especially Lord Seaforth's.

The great post roads in this district have been made in part by Government, and in part by the proprietors. There is a cotton manufactory at Cromarty, and the reporter suggests the idea of manufacturing tar, from the trunk of its fir, and barked in all the mosses of this and other Highland districts.

7069. CAITHNESS. 305,690 acres, three-eighths of which is deep, mossy, and flat moors, covered with heath; three-eighths the mountain, moor, and some hilly pasture, and the remainder in cultivable land, lakes, &c. There is very little wood, either natural or artificial; but excellent lime and freestone. On the whole it is one of the coldest, wettest, and most dreary counties of Scotland; and is in no way remarkable, unless for being the scene of Sir John Sinclair's practical attempts at improvement. Of these the chief seems to have been the enlargement of the town of Thurso: of which, and of various other schemes, ample information is given in the report, and in a number of appendices to it by Sir John himself. (Henderson's General View, 1812.)

1. Property.

Is in few hands, and the Irish practice of tackmen tenants exists, and has existed from time immemorial in the county. These tackmen, as they are called, generally occupy a part of the land, and sublet the remainder to the small farmers, for a certain money-rent, payments in grain, customs, and service (the latter in many cases unlimited), so as to have, upon the whole, a surplus rent for the trouble and risk of recovering their rack-rents from the sub-tenants.

A few young men from the south of Scotland have been brought to this county, to superintend the proprietor's farms or domains, for the purpose of introducing the practice of modern husbandry: these, from time to time, have taken farms in this county; but whether their agricultural skill was superficial, or that they did not understand the mode of farming best adapted to this cold and moist climate, have neither increased the crops, nor improved the landlord's farms placed under their direction; nor has their industry or skill produced better crops on their own farms, than what is raised by a similar class of the county farmers, who have never been out of it.

The principal farmers in the county under review, are intelligent gentlemen, who have been for some time in the army, or followed other avocations, either in the southern counties of Scotland, or in England, where they found their farms upon the principles of modern agriculture, as practised in the southern counties of Scotland, as far as the state of the county, as to climate, roads, the means of improvement, markets, &c. will admit, but at a much greater expense than is done to the southward, and of course much less benefit to themselves. In general they have other means of income, and enable them to live in a social and comfortable state in society; they are better educated than farmers paying a similar rent in England; agricultural knowledge, therefore, is soon inculcated amongst them.

The smaller class of farmers, with but few exceptions, are industrious, sober, sagacious, and moral in their behavior. They have, unfortunately, a turn for litigation, and expend more money than they ought to do in law, by which their circumstances are often injured.

7070. SUTHERLAND. 1,872,000 acres, chiefly of mountain and moor; and a climate about a fortnight later than that of Edinburgh. The greater part of the county is the property of the Marquess of Stafford, whose astonishing, masterly, and successful improvements, have been simply detailed in Loch's work, from which we derived so much information for Staffordshire and Shropshire, and to which we again recur. (Henderson's General View, &c. Loch's Improvements of the Marquess of Stafford, &c. 1819.)

The estates of Sutherland have only lately undergone that change which began to operate in England as far back as the reign of Henry VII. This change had for its object the creation of a middle class by the depression of the barons, and the raising up of the rest of the country. This object was gradually and successfully accomplished in England by the time of Queen Elizabeth, and in the south of Scotland soon after the union of the two kingdoms: but the Highlands, or

most northerly counties, underwent no change till the discomfiture of the Pretender, and the abolition of the heritable jurisdictions then existing in the north, in 1747. This invaluable act having brought the Highland chieftains within the pale of the law, and secured them the same footing as the other gentlemen of the land, they began to receive the same education, to be occupied with the same pursuits, to feel the same desires, and to have the same wants as their brethren in the

south. In order, however, to indulge these propensities, and to be able to appear in the capital with due effect, it was necessary that they should convert their estates to that mode of occupation most suited to their circumstances, and from which they could derive the greatest income. Luckily in this, as in every other instance in political economy, the interest of the individual and the prosperity of the state went hand in hand. And the demand for the raw material of wool by the English manufacturers, enabled the Highland proprietor to let his lands for quadruple the amount they ever before produced to him. These arrangements continued to be carried into effect from time to time, in the southern and central Highlands, up to about the commencement of the French revolution war; not always, however, without serious resistance on the part of the people.

The northern Highlands still remained to undergo that change

which the rest of the island had already adopted. In this district it naturally began to be followed in the counties situated nearest to those into which it had already been introduced. In Ross-shire, accordingly, it was undertaken on a great scale, in 1792. The dissatisfaction produced was so great, that the most serious affrays took place, and the military had to act, and blood was shed before quiet was restored. Between that time and 1815, the greater portion of the county of Sutherland, not belonging to Lord and Lady Stafford, was arranged according to those plans so universally adopted. This ancient condition of society prevailed longer on the estate of Sutherland, than in any other part of the island, on account of its difficult access across the Dornoch and other friths, and the total want of roads in the county till 1809. The estate of Sutherland (fig. 816 a, a, a) including the barony of Assynt, (b, b, b)

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NORTHERN OCEAN



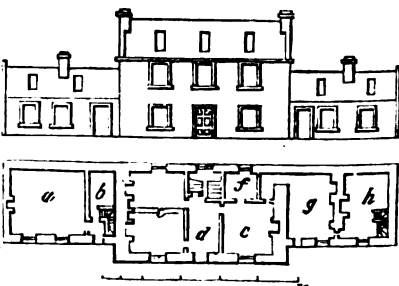
and the late purchases made by the Marquess of Stafford: is computed to contain more than 400,000 acres. The estate of Lord Reay (c) is more than half that extent. The residue of the county belongs to different lesser proprietors (d to a).

In 1809 was begun a line of road, conducted according to the best principles of the art, and made in the most perfect manner, from the town of Inverness by Beaulieu and Dingwall, to the boundaries of the county of Sutherland; two excellent stone bridges, consisting of five arches each, having been built across the Beaulieu and Conon rivers. The two principal obstructions these roads had to contend with and to surmount, were those which were occasioned by the two friths of Dornoch (fig. 816. 1) and of Loch Flice (2). The former, especially, presented obstacles of considerable moment, arising out of the width of the channel, and the want of a proper foundation on which to construct a bridge. If the same plan had been followed in this instance, which has been adopted on the two southern friths, namely, of ascending to the point at which the frith terminates and becomes a river, it would have carried the road so much into the interior, as to counterbalance those advantages which are at all times obtained by the substitution of a bridge in the place of the most perfect ferry which can be established. To avoid either of these inconveniences, a very careful survey of the whole frith was made, and the engineer, Telford, determined to recommend the construction of an iron bridge of magnificent dimensions (See an engraved view in the Ed. Engr.) at Bonar, a point where the frith narrows itself considerably; and above which it again expands, though not to its former dimensions. This structure consists of an extensive embankment, with two stone arches of fifty and sixty feet span respectively; and one iron arch of 150 feet span. It cost 13,971*l*. From this point, the heritors of Sutherland have constructed a road (4, 4) to Tongue (c), the seat of Lord Reay, situated upon the northern coast.

In many places, these roads are cut through the hardest rock; in others they are obliged to be supported on bulwarks of solid masonry. Expensive drains to protect them from the mountain floods, and bridges over the innumerable streams that rush from the hills in every direction, are required. These must be formed of the most durable materials and the best workmanship, to resist the impetuosity of the torrents. No-

thing will set this in so striking a point of view, as to state, that upon the projected road to Assynt, a distance of forty-six miles, three bridges of three arches each, two bridges consisting of one arch of forty feet span, five of twenty feet span, three of twenty-four, six of eighteen, two of twelve, besides many others of inferior dimensions, would be required. On the Stafford estate excellent inns, often combining farmhouses, have been built in a number of places at an enormous expense. As an example, we may refer to one (fig. 817.) containing an outer

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kitchen and servants' stair (a), with a pantry (b), two best parlors, with movable partition for great occasions (c), principal entrance (d), a small parlor (e), small room (f), kitchen (g), back kitchen and servants' stair (h). Over are five bedrooms, and nine garrets for beds.

Thus, in the course of twelve years, has the county of Sutherland been interested, in some of its most important dis-

tricts, with roads, in point of execution superior to most roads in England. And owing to the equally praiseworthy exertions of the counties of Ross and Inverness, on the one hand, and of Caithness on the other, the same perfect means of communication now exists, from the burgh of Inverness to the town of Thurso upon the North Sea.

Few districts of Scotland possess so small a proportion of land fit for cultivation, compared with its extent, as Sutherland; and previous to the year 1811 but even a small portion of that was brought into cultivation. Each share is fringed (if the expression may be used) with a narrow border of arable land, which, on the south-east coast, extends from a few hundred yards to about one mile in breadth: the interior consists entirely of mountains.

The lands were let to tacksmen, as in Ireland, till in latter times, when a certain district was let to the whole body of tenants resident in each "town or township," who bound themselves, conjointly and severally, for the payment of the whole rent. This land was held, as expressed in Scotland, "run rig," or like common field land in England.

The effect of this arrangement was to scatter thickly, a hardy but not an industrious race of people up the glens, and over the sides of the various mountains; who, taking advantage of every spot which could be cultivated, and which could with any chance of success be applied to raising a precarious crop of inferior oats, of which they baked their cakes, and of bear, from which they distilled their whisky, added but little to the industry, and contributed nothing to the wealth of the empire. Impatient of regular and constant work, all the heavy labor was abandoned to the women, who were employed, occasionally, even in dragging the harrow to cover in the seed.

To build their hut, or get in their peats for fuel, or to perform any other occasional labor of the kind, the men were ever ready to assist; but the great proportion of their time, when not in the pursuit of game, or of illegal distillation, was spent in idleness and sloth. Their huts were of the most miserable description. They were built of turf, dug from the most valuable portions of the mountain side. Their roof consisted of the same material, which was supported upon a rude wooden frame, constructed of crooked timber, taken from the natural woods belonging to the proprietor, and of moss-fir dug from the peat bogs. The situation they selected was uniformly on the edge of the cultivated land, and of the mountain pastures. They were placed lengthways, and sloping with the declivity of the hill. This position was chosen, in order that all the filth might flow from the habitation without further exertion upon the part of the owner. Under the same roof, and entering at the same door, were kept all the domestic animals belonging to the establishment. The upper portion of the hut was appropriated to the use of the family. In the centre of this upper division was placed the fire, the smoke from which was made to circulate throughout the whole hut, for the purpose of conveying heat into its farthest extremities. The effect being to cover every thing with a black glossy coat, and to produce the most evident injury to the appearance and eyesight of those most exposed to its influence. The floor was the bare earth, except near the fire-place, where it was rudely

paved with rough stones. It was never levelled with much care, and it soon wore into every sort of inequality, according to the hardness of the respective soils of which it was composed. Every hollow formed a receptacle for whatever fluid happened to fall near it, where it remained until absorbed by the earth. It was impossible that it should ever be swept; and when the accumulation of filth rendered the place uninhabitable, another hut was erected in the vicinity of the old one. The old ruins were used in the construction of the new cottage, and that which was abandoned, formed a valuable collection of manure for the next crop.

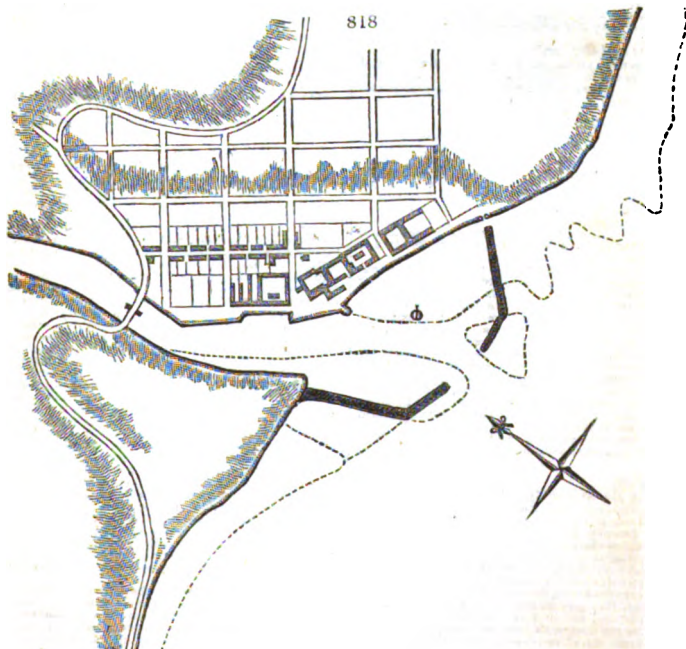
The introduction of the potato, in the first instance, proved no blessing to Sutherland, but only increased this state of wretchedness, inasmuch as its cultivation required less labor.

So long as this system just described remained in full force, no attempt could be made to improve or meliorate the situation of these poor people. To better their condition, however, to raise them from such a state of continual poverty and occasional want; to supply them with the means, and to create in them the habits of industry, was, and is the bounden duty of the owners of every such property. And it was not less their duty to do so, because the same arrangement which was calculated to produce this salutary effect, was at the same time the best suited to increase the value of their property, and to add to the general wealth of the community.

The fundamental principle of agricultural improvement in this case was derived from no speculative reasoning, but from what has actually taken place in a different but similarly circumstanced part of the kingdom.

It is well known that the borders of the two kingdoms were inhabited by a numerous population, who, in their pursuits, manners, and general structure of society, bore a considerable resemblance to that which existed in the Highlands of Scotland. When the union of the crowns, and those subsequent transactions which arose out of that event, rendered the maintenance of that irregular population not only unnecessary, but a burden to the proprietor to whom the land belonged, the people were removed, and the mountains were covered with sheep. So that it had been for a length of time proved by the experience of the stock farmers of those mountain tracts which comprise the northern districts of England, and the southern parts of Scotland, that such situations were peculiarly suited for the maintenance of this species of stock. Taking this example as their guide, experience had still further proved, that the central and western Highlands of Scotland were equally well calculated for the same end. Reasoning from this success, and observing that the climate of Sutherland, owing to its vicinity to the ocean, and to its being considerably intersected by arms of the sea, and much more moderate than this latter district, it was fairly concluded that this county was even better fitted for this system of management than the heights of Perthshire and Inverness-shire. The inferior elevation of its mountains contributed still further to this effect, and held out every encouragement to adopt the same course which had been pursued with such success in both parts of the kingdom.

The propriety of converting the mountainous parts of the county into sheep-walks was in this way rendered evident, provided the

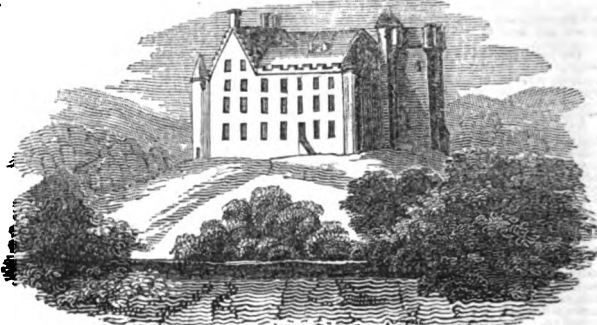


people could be at the same time settled in situations, where, by the exercise of their honest industry, they could obtain a decent livelihood and add to the general mass of national

wealth, and where they should not be exposed to the recurrence of those privations, which so frequently and so terribly afflicted them, when situated among the mountains.

The principle of providing for the lower class of tenants by the establishment of *Johnnies* was thus derived. It had long been known, that the coast of Sutherland abounded with many different kinds of fish, not only sufficient for the consumption of the country, but affording also a supply, to any extent, for more distant markets, or for exportation when cured and salted. Besides the regular and continual supply of white fish, with which the shores thus abound, the coast of Sutherland is annually visited by one of those vast shoals of herrings which frequent the coast of Scotland. It seemed as if it had been pointed out by nature, that the system for this remote district, in order that it might bear its suitable importance in contributing its share to the general stock of the country, was, to convert the mountainous districts into sheep-walks, and to remove the inhabitants to the coast, or to the valleys near the sea. Several sea-ports were improved by the construction of piers (fig. 818 &c.) and breakwaters (4); and the plan of a town being formed, the inn, church, post-office, market-place, and other public buildings, were erected by Lord Sutherland, and the most liberal encouragement given by loans of money, grants of land at little or no sea duty, &c. to fishers, manufacturers, tradesmen, &c. both on a large and small scale, to come and

settle there. Such is the policy of Lord Sutherland's operations, in which he has expended, and continues to expend, independently of the cost of improvements on the mansion (fig. 819.) and part of Dunrobin, immense sums. It is only the success has equalled the most sanguine expectations; but for the very interesting details of execution, our limits oblige us to refer to the work of Loch, which, 819



as already observed, (7010.) we consider of very singular agricultural interest.

7071. INVERNESS-SHIRE. Upwards of 7,000,000 of by far the most mountainous region in Scotland. It reaches from sea to sea on the main-land, and comprehends many islands, which are scattered far and wide. The hills and moors were formerly covered with fir woods, the remains of which are dug up in all the moors in abundance. The climate is rainy, mild on the west coast, but less so on the east. The soil of the vales is loamy or gravelly. The principal economical minerals are granite, limestone, and slate, but lead, iron, marble, &c. have been found in different places. The county is remarkable for its native fir woods, and for that stupendous national work, the Caledonian Canal, now nearly completed. Improvements were first commenced about Inverness by Cromwell's soldiers. (*Robertson's General View*, 1810.)

1. Property.

In few hands, largest, Lord Macdonald, of the Isle of Skye, the only nobleman who resides in the county. The mountain farms are large, and, as in similar cases, reckoned by miles, or by the number of sheep they are supposed to carry.

2. Gardens and Orchards.

To be found in a few places; and some old pear trees, planted by the monks, are still in a bearing state at Beaulieu, and one or two other places. There is an excellent fruit and forest tree nursery at Inverness.

3. Woods and Plantations.

The Scotch pine, for the most part, took possession of the south side of the valley, and made choice of a northern exposure; the birch, the hazel, and the oak, occupied the warmest side of every district, while the alder and a few sables ran along the streams. Not only the continental parts had this natural mantle, but the islands of this country appear, from the fragments of trees found in the moors, to have been at some remote period, mostly, if not wholly, under forests. The only remains of growing wood at present in the islands, are at Portree and Slate, in Skye, and a little in the island of Raasay.

Trees were burned or felled to make room for man, by enlarging the pasturage of cattle, and affording fresh surface for corn. At present the Scotch pine covers more surface in this county, than all the other kinds of trees taken together; and the natural pine woods of Inverness-shire exceed the quantity of this wood growing naturally in all the rest of Britain. In Strathgairn alone, it is reported, upon authority which cannot be called into question, that fifteen thousand acres of ground are covered with natural firs. On the south sides of Locharkilg, of Glenharvey, of Glenmoriston, Strathgairn, Glenstrathra, and at the head of Lochabell, as mentioned above, the bounds of country under this wood are reckoned by miles, not by acres. The oak woods of this county are not so large, nor so well taken care of, as they are in Perthshire.

There are extensive birch woods, the timber of which is used for fencing and the coarser articles of husbandry, and the bark for tanning.

4. Live Stock.

Cattle are of the Skye or Kyle breed, usually, however, known as the Highland breed, and already described. (6180.) The cows yield to be the quantity of milk of the Highlands in low counties; generally from two to two and a half gallons; but it is rich, and productive of butter of excellent flavor. The diseases of Highland cattle are few. The manner of disposing of cattle is as follows: When the drovers, from the south and interior of Scotland, make their appearance in the Highlands, which always happens during the latter end of April, or the beginning of May, they give intimation at the churches, that upon a particular day, and in a central place of the district, they are ready to purchase cattle from any who offer them for sale. The drovers are of two descriptions: either those who buy by commission for persons of capital, who, being disinterested of their own skill, or averse from fatigue, choose to remain at home; or those who purchase cattle for their own account. Much address is used on both sides, to feel the pulse of the market at these parochial meetings, before the price of the season

be mutually settled; and it may happen, that many such small trials or meetings take place in different parts of the Highlands, before the price be finally determined. The anxiety on both sides is sometimes so great, that the cattle are given away upon a conditional contract, that if the price rises within a limited time, the seller will receive so much more; but if the lean cattle fall in value, the drover will get a reduction. Sheep are extensively reared, and generally of the Linton or Lammernuir black faced sort. The Cheviots are also very prevalent.

Horses either the native pony, or improved breeds from the low countries farther south.

Rees are frequent in a wild state in all the woody and warm glens.

5. Political Economy.

Roads and bridges have been going forward at the expense of Government, ever since 1745, and earlier. The Caledonian Canal is well known for its magnitude and the excellence of its execution. There are various fisheries on the lakes and coasts; but few manufactures.

As one of the obstacles to improvement, common to this and the other Highland counties, and indeed to every country, the reporter mentions the stubbornness of the common people, in adhering obstinately to old and slowly habits, is no inconsiderable obstacle. As men rise in years, the reluctance to make any uncommon exertions, and particularly to introduce a change into any thing, which relates to their personal accommodation, gradually grows upon them. Having been long accustomed to a certain course of employment, of gratification, of lodging, of dress, and of food, they resist strenuously the relinquishment of any of these habits; they move on in the current of human life mechanically, like a wheel, without any apparent alteration in their motion, unless it be accomplished by some external force; and if left to themselves, they never change their course. This propensity to remain the same men, and to retain the same customs, is more unconquerable among the illiterate and ignorant, than among the learned or enlightened part of mankind. By means of society, of conversation, and of reading, the latter acquire an enlargement of the mind, to which the former are strangers; and if they be accustomed to reflect on what they hear and see, they are always more open to conviction. When that malice of the vulgar, which is the child of ignorance, takes that hold of the mind, it becomes so obstinate, that it can seldom or never be removed. Its universality would lead to the opinion, that it is an original principle in the human frame, but its progressive influence, which increaseth with age, and the apology which the vulgar urge in their own defence, that their fathers did such things before them, would imply that it is the effect of imitation.

We cannot, however, hesitate for a moment in pronouncing, that the general propensity of the world is more promoted by the steadiness of the vulgar, even when it amounts to obstinacy, than it would by fickleness, and a desire of change. The very existence of order, the continuance of established government, the enjoyment of the comforts of society, the sweet decrements of friendship, the exercise of the religious principle, and many of the highest blessings of life, flow from the reluctance against innovation, which, with such inactivity, resists new modes of cultivation in the management of soil.

7072. ARGYLESIRE, nearly two millions of acres; the eleventh part of Scotland, and the thirtieth of Great Britain, and nearly the whole of the Scottish kingdom from A. D. 503 to the subjugation of the Picts in 843. The surface of the country is rough and mountainous: in the northern parts "alps piled on alps hide their heads in the clouds." The climate is moderately mild, very moist in the vales and on the coast, but cold and severe on the elevations. The soil of the vales is generally light; the minerals are lead, iron, coal, freestone, granite, limestone, slates, &c., but the two first are not worked at present. There are numerous bays, inlets, and lakes, in some of which excellent fish is caught. The country is in no respect remarkable in an agricultural point of view: it furnishes immense quantities of cattle and sheep to the graziers and feeders of the south, and there are some oak coppices and artificial plantations. (*Smith's General View*, 1810.)

1. Property.

In the hands of 156 owners. Farms of the smaller size reckoned by acres, the largest by miles. One, supposed to be the largest in Britain, is eighteen or twenty in length by three or four miles in breadth; several contain from two to six square miles: object, as in Inverness-shire, the breeding of cattle chiefly, and next sheep.

2. Improvements.

Have been made by most of the proprietors: some plans of farming are given by the reporter. One is circular, and consists chiefly of cattle sheds; but the elevation is of the most Gothic, which is derived from most of the modern Highland castles. The fin share plough (1799) was invented in this country by the reporter.

3. Woods and Plantations.

There are about 30,000 acres of coppice, chiefly oak, birch, and hazel, which being now valuable for the bark, and the poles to be used as spokes for wheels, is beginning to be enclosed

from the sheep by stone walls. The Duke of Argyle is the chief planter, and his larch plantations are of great extent, and contain an immense quantity of valuable timber. The oldest and largest of the trees at Inverary are supposed to have been planted by the Marquess of Argyle betwixt the years 1650 and 1660. Those of the next largest size and age were raised from the seed by Archibald Duke of Argyle (called a tree-monger, by Walpole) in 1746 or 1747. These consist chiefly of larches, New England pines, spruce and silver fir.

4. Live Stock.

Cattle the west Highland breed; the best in the districts of Argyle, Lorn, Ilay, Colonsay, and Mull.

Sheep, till lately, much neglected.

Horses, a hardy native breed larger than the pony.

5. Political Economy.

Roads as in Inverness-shire. A canal from the coal works in Campbellton to the sea: few manufactures. An agricultural society at Kintyre.

7073. THE HEBRIDES, including Bute-shire, are nearly 200 islands, containing 2,037,760 acres of rocky, hilly, and, in some islands, mountainous country, with a severe, unsteady, moist climate, and a soil generally light. Almost all the minerals are found with which the continental part of Scotland is furnished. Slate, lime, granite, marble, and freestone, are in great abundance, and coal has been found in various places, though it has not been successfully worked. Seateite, or soapstone, from which porcelain is manufactured; fuller's earth, and a great variety of other economical minerals, besides rare and curious species, are found in different islands. (*Headrick's Survey*, 1796. *Macdonald's General View*, 1811.)

1. Property.

In the hands of forty-nine proprietors; highest rental 18,000*l.* and acre 312,500. A great many tacksmen. Those of Ilay are said to "combine with the spirit and elegant hospitality indigenous in this country, the accuracy in dealing, the punctuality in paying, and all the useful qualifications of first-rate low country farmers. It must not be forgotten, in mentioning the order of tacksmen, that they are exceedingly useful, and often necessary, for maintaining good order and government in the country. Without their aid, the efforts of the clergy and officers of justice would be painful and unavailing; and therefore they ought not to be rashly banished, were they to be viewed in no other light than merely as subsidiaries to the police and moral administration of the Isles.

2. Buildings.

Farm-houses throughout the Hebrides are either houses of tacksmen, of tenants, or subtenants. Tacksmen's houses, though still far behind those of considerable farmers in the principal counties of England and the lowlands of Scotland, are, however, in general, beginning to be tolerably decent and comfortable; and on all the large estates they have been very much improved within the last twenty-five years. Most of them are now built of stone and lime, and roofed with blue slates, two stories high, and furnished with kitchen and other accommodations. In many instances indeed, the office-houses are still in a deplorable state, but even these are rapidly improving; and should this order of farmers exist for half a century longer, their houses will, probably, be as commodious, and their office-houses as judiciously planned, as those of the same description of men in any part of Great Britain.

The houses of the occupying tenants are, generally speaking, wretched hovels, and those of the subtenants, nasty and miserable beyond description. Pennant describes them as habitations made of loose stones, without chimneys or doors, excepting the faggot opposed to the wind at one or other of the apertures permitting the smoke to escape in order to prevent the pains of suffocation. Furniture corresponds: a pot-hook hangs from the middle of the roof, with a pot hanging over a grateless fire, filled with fare that may rather be called a permission to exist than a support of vigorous life: the inmates, as may be supposed, lean, withered, dusky, and smoke-dried. It cannot be denied, that this picture is, in some degree, realized in a few of the Hebrides, even at the present day.

The cottages in the Hebrides are almost universally so miserable, both in plan and execution, that they deserve mention only as proofs, that a sensible and sagacious race of men may, by a combination of unfavorable circumstances, not only be gradually brought to endure privations, which, to their equals in other countries, would seem intolerable, but also, in the course of time, they may lose the power, and even the will of surmounting them. Three-fourths of the 40,000 cottagers of these and many of the other islands are of the same Indian tribe: Iales live in hovels which would surpass any Indian tribe in point of population and extent. At least, 7000 of the natives of Lewis (for instance) know nothing of a chimney, table, glass window, house flooring, or even hearth stone, by their own experience at home; and what we call their furniture is, as may be imagined, wretched and scanty beyond description, corresponding with their shabby exterior.

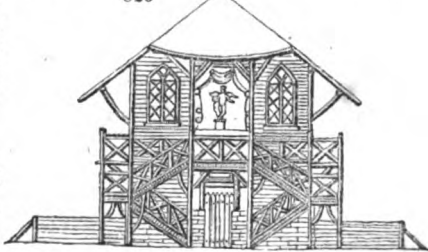
In the woods of the Park at Bute were formerly fine specimens of Swiss cottages and other fancy wooden buildings. (*fig. 820.*)

3. Occupation.

In estimating the size of Hebridean farms, the common plan is to attend to three leading objects; first, the number of live

stock which the farms in question can maintain; secondly, the number of bolls of grain which can be sown, or of ploughs requisite for their tillage; and, thirdly, the quantity of kelp that can be made upon them.

820



"Grazing farms, whether for sheep or cattle, must gradually be enlarged; and kelp, or merely agricultural farms, must as naturally become limited and confined in point of extent. The hay on many of the grass-farms, and sometimes the corn on arable grounds, is obliged to be dried by hanging on poles, trees, or rods, (*fig. 821.*) as in Sweden.

821



4. Implements.

Some are nearly peculiar to the Hebrides, as the caschroon or crooked spade (*fig. 822.*), which, in two parishes in the Isle of Lewis, entirely supersedes the use of ploughs in the raising of corn and potatoes. The great advantage of this instrument is, that it enables the operator to work in moors or bogs, where no horses can walk, and in stony ground inaccessible to the plough. Many districts of Harris and of Skye would be unsusceptible of tillage without it. Its superiority to the common trenching spade, or to any tool which penetrates the ground perpendicularly, is very great, resulting both from the snake with which the operator wields it, and the length of the horizontal clod which its powerful lever enables him to turn over.

The *rielle*, or sickle plough, a sort of paring plough, is used for cutting the strong sward of old land, or the tough roots of plants, which would otherwise greatly impede the passage of the plough.

The *clon-mail*, or wooden tongs, for drawing thistles, &c. differs little from those in use in England. (fig. 294.)

822



5. Arable Land.

Tillage is in its infancy over the Hebrides, in all the isles northward of Mull, excepting half a dozen farms in Skye, a part of M'Leod, of Rassy's estate, two farms in Uist, and a little lately done in Lewis, near Stornaway, and by Campbell, of Islay, on a small island between North Uist and Harris. These improvements have been carried on within the last fifteen years.

It would be rather ludicrous than useful to describe the tillage generally practised in the Hebrides; and, accordingly, we shall not dwell upon it, or insult the common sense of the natives, by seriously requesting them to abandon the many barbarous customs which have so long disgraced their country. A man walking backwards, with his face towards four horses abreast, brandishing his cudgel in their noses and eyes, to make them advance to their enemy, followed by a rattle plough employing a horse and two men, the three commonly altogether superfluous, still followed by four horses, dragging clumsy harrows, fixed by hair ropes to their tails, and almost bursting their spinal marrow at every tug and writhing of their tortured carcasses. All this cavalcade, on ground unenclosed, undrained, and yielding at an average little returns for the seed sown, and sometimes lost altogether by the depredations of cattle, or by accident in a late harvest, is a barbarous spectacle, which must gradually vanish. It will soon give way, as it has already done in Lewis, Colonsay, and part of Skye, to improved systems of tillage.

6. Gardens and Orchards.

It is not to be expected that much should be done in gardening in a district of which by far the greater part of the proprietors are non-resident, nor is the climate suitable for that art. The winds are too violent, and the sun too shy of showing his face. Until trees and other sorts of shelter become, therefore, more general, the gardens and orchards of the Hebrides will probably be little more than an empty name.

7. Woods and Plantations.

In the sixteenth century it appears most of these isles were covered with woods, and even so late as Buchanan's time. One exhilarating remark, however, occurs to the traveller who traverses those bleak and woodless recesses, amidst the melancholy impression upon him by comparing their present aspect with the description which he reads in Buchanan and Monro, namely, that where trees have formerly grown they will grow again; and that any regions which were once sheltered and adorned by the hand of nature, may still be in a far higher degree improved and embellished by the industry of man.

In Bute the late Lord Bute, in Islay Campbell of Shawfield, and in Skye Lord Macdonald, have planted extensively and successfully, and other proprietors are following the example.

8. Live Stock.

The ancient Hebridean breed of cattle are now no longer to be found. Some persons imagine it to be the Skye, others the Mull, and others again the Lewis or Long Island variety. A person habituated to accurate observations on cattle, can easily distinguish those different breeds from one another, and all of them from the larger breed now introduced into Islay, Colonsay, and some parts of the Long Island, especially Barra, by

persons who pay attention to so important a department of agrestic economy.

Sheep. Only lately attended to. There are now three different breeds to be met with in almost all the larger islands, viz. 1. The native aboriginal breed, common to the whole Hebrides, forty years ago, and still more numerous than the other two breeds taken together; 2. The Linton, or black faced sheep of the south of Scotland; and, 3. The well known fine-wooled Cheviot breed. The historian Laing, has a large flock of Merinos in the Orkneys.

Horses. The Hebridean breed of horses resembles that which we find in almost all countries of the same description of climate and surface. It is small, active, and remarkably durable and hardy. It possesses the prominent marks of perfection in this sort of animal, i. e. it is strong and nimble, of a good form and proper size for its work, healthy, patient, good tempered, and very easily kept in good condition. It is found in the Highlands of Scotland, in Wales, Norway, Sweden, Switzerland, Tyrol, Hungary, and Transylvania, and, with little variation in shape and size, in all the hilly districts of Europe. The average height of what are deemed reasonable horses, is from twelve to thirteen hands, but that of the lower tenants horses in Mull, Jura, and the northern isles, rarely exceeds eleven or twelve hands. They are handsomely shaped, have small legs, large manes, little neat heads, and manifest every symptom of activity and strength. The commonest color is grey, bay, and black, the last mentioned color is the favorite. Excepting in Islay and in a few gentlemen's farms, not exceeding two dozen in number in all the Hebrides, very little has hitherto been done for bringing this breed to perfection, or preventing it from degenerating.

The breeding of horses for sale is not carried on to a considerable extent in the Hebrides; nor does any of them export at an average of ten years more than it imports, excepting Islay, and perhaps Arran and Eigg.

Hogs. Considerable numbers of hogs are now reared in the Hebrides, where the ancient prejudice against pork has gradually vanished, since their intimate connection with the Lowlands of Scotland and England.

Goats, still maintain their ground on several islands, and in certain circumstances constitute a valuable stock. But, wherever wood is to be reared, and enclosures guarded and preserved with attention, they must be banished; for, being more a browsing than a grazing animal, the goat will destroy every nerve to crop twigs and plants of every description, and is a mortal enemy to every species of growing woods.

New species, or varieties of stock. Excepting the ass, and perhaps the mule, it is not clear that this extensive region would gain by introducing any new species of domesticated animals; indeed, the great want felt by the Hebrides is not that of animals, but of food in winter and spring for those which they possess. The native breeds of cows and horses are, perhaps the very best possible for the country to support, and may, by due attention to feeding, and to selecting the strongest and handsomest pairs as breeders, be improved to an indefinite pitch of excellence. The breeds of sheep already recommended and described may be improved, and reared to five times their present numbers, without seriously injuring the agriculture or other interests of the country; and a vast accession of wealth and food might accrue from breeding a competent number of hogs, for which these isles, abounding in potatoes, are extremely well adapted. But all these improvements must go on progressively and slowly, and they must advance in the train of other agricultural and economical improvements.

9. Political Economy.

Roads much wanted, and, excepting in Bute, Islay, and Skye, in a very wretched state. No iron railways or canals. No equal portion of European population, nor even excepting the Russians, and most uncivilized Poles and Croats, possesses so few manufactures, as the people of the western isles of Scotland. This is, among other causes, a principal source of poverty and depression of the people. It makes the little money acquired by the fisheries, and drawn in exchange for black cattle, kelp, and the other productions of the district, continually flow out of it, and prevents that gradual advancement in wealth, comfort, and agricultural and economical improvements, which are conspicuous in all other parts of Scotland; and although it does not absolutely keep these isles in a quiescent state, it greatly retards their progress.

Kelp, is a well known Hebridean manufacture, and is in an advancing state. Macdonald, of Staffa, is distinguished for his attentions to this branch of Hebridean economy; and has accordingly preserved for his kelp a character, which enables him to dispose of it at a higher price than the average of the Hebrides obtains. This results principally from his being begun early in summer, its being duly attended to in the carriage and drying of the sea-weeds, and especially its being kept clean and unmixt with clay, sand, stones, and all other impurities, which greatly diminish the value of kelp on many Hebridean estates.

SECT. IV. Agricultural Survey of Ireland.

7074. IRELAND, the largest island in Europe next to Britain, contains about 20,000,000 of acres, much less varied in surface, soil, and climate, than the latter island. There are several mountainous or hilly districts, chiefly in Ulster in the north, and Munster in the south, and very extensive flat bogs in the middle districts, and upland bogs or moors wherever there are hills or mountains. All these bogs, whether low or high, are on good soil, which, indeed, may be considered in connexion with the moist warm climate as their chief cause. Nine-tenths of the soil is a loam on a limestone bottom, fertile, or capable of being rendered so at little expense; the remainder is chiefly thin clay on limestone. The bogs are here considered as mere coverings to soils; their surface exceeds 1,000,000 of acres. The climate is milder and more equable than that of England; and with the dry soil, as Wakefield remarks, is admirably adapted for pasture and occasional aration.

7075. Of the agricultural circumstances of Ireland generally, we have already given a

condensed account (803.), and shall here submit some brief notices as to each county. These unavoidably present a degree of simeness incompatible with much interest or instruction. There are agricultural surveys of but a few of the Irish counties, so that we have drawn our resources principally from the copious and highly interesting work of Wakefield, and some more recent statistical writers and tourists.

7076. DUBLIN, 240,000 acres; one eighth in mountain and waste, a tenth in buildings, roads, rivers, &c. and the remainder in arable and pasture. (Archer's Statistical Survey, &c. 1801. Sup. Encyc. Brit.)

The climate is drier than that of some others; east and north-east winds are less frequent than in England, but storms from the south-west and west are more frequent. A average number of dry days in Dublin for ten years, 179; or nearly half the year wet, and half dry.

The soil is generally shallow, and the substratum almost universally a cold clay. There is very little turf bog in the neighbourhood. Some considerable tracts among the mountains in the south. No minerals or fossils of much value have been discovered, or are now worked, but there are some good quarries of freestone; limestone, and limestone gravel, abound in various parts.

Livestock is property in this county is a much more marketable commodity than in most other districts of Ireland. There are here no large territorial domains. Leases vary in their terms, but commonly include a life, for the purpose of creating a vote.

Farms are in general very small near the city, seldom more than twenty or thirty acres; but at a distance, from 50 to 150 acres.

The farm buildings are, for the most part, very inefficient. Near the city, the fences are of white stone; but in the remote parts, they are nothing more than a bank and ditch. Lime, limestone gravel, and marl, are used as manures. The city of

7077. WICKLOW, 500,000 acres, in great part mountain and bogs, and without inhabitants. (Fraser's Survey of Wicklow, 1801. Sup. Encyc. Brit.)

The climate so mild, that the myrtle flourishes in such profusion, as to have been sometimes used for making stables. The common laurel, Portugal laurel, and arbutus, attain a great size, and can scarcely be recognized to be the same shrubs. Dublin is supplied with early potatoes and house-lamb from the sea-coast of Wicklow, the climate of which, according to Mr. Wakefield, is decidedly different from that of the rest of Ireland. This is the only part of that country where the grapes are growing out of doors.

Metallic ores are supposed to abound; copper and lead have been worked, and gold has been found.

There are no navigable rivers or extensive lakes. Some of the streams precipitate themselves from considerable heights, forming beautiful cascades, but not remarkable one is at Powerscourt, where the water falls from a height of 360 feet.

Landed property in the centre of the county in large estates:

7078. WEXFORD, 597,760 acres, mountainous on the north and west, a light soil and tolerable cultivation on the east, and in other parts a cold stiff clay, unimproved by culture. (Wakefield. Fraser's Survey of Wexford, 1807. Sup. Encyc. Brit.)

The climate is mild and favorable to the growth of timber, which abounds here more than in most counties. There are some large myrtles in the open garden.

The landed estates are large, from 2000L. to 10,000L. a year, and into farms of various size; but there is little of that minute division which is common in other parts of Ireland; nor are there any rich grazing farms. The soil, at which the principal article is better, are numerous, but generally under bad management. The cows themselves are of a very inferior description; and the same character belongs to their sheep, which forms a very inconsiderable part of the live stock. In their modes of cultivation, however, the farmers here are more advanced than in many other parts of the island. The baronies

7079. KILKENNY, 510,008 acres mountainous, but with some rich and beautiful vales on the banks of the Barrow, Suir, and Nore, and a climate so mild that in winter the thermometer seldom falls below the freezing point, while in summer it ranges between seventy and seventy-five degrees. There is less humidity than in Dublin and Wicklow, as well as less of the east and north winds. (Tighe's Survey of Kilkenny, 1802. Sup. Encyc. Brit.)

This county has many romantic situations, ornamented with country seats; and its flat districts, where the tillage farms are more extensive than in most parts of Ireland, present a prospect very different from what is often met with in that country.

The soil is for the most part on limestone, and there are very few bogs. The largest colliery in Ireland is at Castle Comer, near the northern boundary of the county. It is a stone coal raised in immense pieces, but of a subterranean quality, which renders it disagreeable, and sometimes noxious, and it is, therefore, less fit for being used in families. For this reason, and also from the great expense at which it is raised, English coal is used in preference, even within a few miles of the works. There are several quarries of marble, chiefly of a black color, of which a few tons are exported. Excellent sandstone and manganese, and iron and lead ores, have been observed in different parts.

Property in land is in several large estates, and many of a moderate extent, not exceeding a rental of 2000L. a year. The principal proprietors are Lords Bexborough, Clifton, and Ormsand. The leases are in general for three lives, and partnership leases are common, though prohibited on one of the largest properties. On the estate the tenant is allowed to transfer his lease to one individual, but not to divide his farm.

Of the husbandry the most important department is the dairy, which extends over the greater part of it. The most considerable dairies are in the districts called the Welsh, or White Mountains, a tract of dry, grassy land fit for tillage, but still in its natural state, and not enclosed. About 2000 Irish acres of this land were held in 1800 by one family, who kept 120 cows. The cattle are not for the most part housed in winter, and only those that are about the time of calving, get a

Dublin might afford the means of enriching a tract of several miles around it, but its street dung is so little valued, that it is sometimes brought to Scotland by coasting vessels as ballast, and much of it is thrown into the Liffey.

On the arable lands, two crops of wheat in succession, and after these two of oats, without fallow or green crop, are frequently taken, according to Archer. Barley is not cultivated extensively. The natural pastures are, with few exceptions, of an inferior quality. There are few or no flocks of sheep in the possession of farmers. In the city, and within four miles of it, about 1000 cows were kept in May, 1801, according to Archer, where there were formerly near 7000. The old Irish breed of cows is almost extinct, and their place is supplied by the short horns and other breeds from England.

There is a considerable salmon fishery on the Liffey, in which also abundance of eel and pike are caught. There are sea fisheries of herrings, white fish of different kinds, and oysters both in natural and artificial beds; the shells of some of the (ed oysters have been found as large as a horse shoe.

The manufactures of the county are chiefly of linen of different kinds, but they are of little importance. The colonial commerce with Dublin is considerable.

7079. KILKENNY, 510,008 acres, mountainous on the north and west, a light soil and tolerable cultivation on the east, and in other parts a cold stiff clay, unimproved by culture. (Wakefield. Fraser's Survey of Kilkenny, 1802. Sup. Encyc. Brit.)

Earl Fitzwilliam's nearly 100,000 acres. The sea coast is much divided and abounds with villas, the temporary residence of the wealthy citizens of Dublin. It appears to be 7 miles Wakefield, "to contain more gentlemen's seats than the same space in the vicinity of London." The common period of leases is twenty-one years and a life. Potatoes, and all the usual kinds of corn, are cultivated; but turnips, clover, and other manuring crops, only partially. Marl, and limestone gravel, are the principal manures, irrigation is practised, a breed of fine woolled sheep, peculiar to the mountains of this county, exhibit the only traces of a distinct race of short-woolled sheep in Ireland.

The herring fishery in the bay of Wicklow is the best in Ireland; the herring, flannels are extensively manufactured, but scarcely any linen.

of Barley and Bangle have been long noted for their great crops of barley & beans, too, are cultivated with success, as well as clover and turnips; the drill system is common for potatoes, and preferred to any other method; and lime, though brought from a distance at a great expense, and also marl, are very extensively employed as manure. The tenantry, including the cottars, are accordingly in a much better condition, industrious, provident, and many of them comparatively wealthy. Here, as in Cork and Waterford, whole fields are kept under furze, which, in this mild climate, is pretty much used as fuel. The bakers employ it for heating their ovens, of which a considerable number are employed, as a good deal of wheaten bread is consumed in these counties.

little hay on the fields, where the horses also are kept all the year. They fatten pigs to the weight of five hundred weight. The produce of the best dairies is one hundred weight and a half, or three firkins of butter per cow, and each cow requires from one and a half to three Irish acres. The dairies are all devoted to dairymen, which is common in Munster, is but little known in Kilkenny, the cows belonging to the dairymen themselves, who, in some situations, breed them on their own farms, and in others prefer buying them at a proper age. Too little attention is paid to cleanliness in their dairies, especially in the northern district; and for this reason, according to Wakefield, though Irish butter, when fresh, is preferable to any in Europe, yet it "is in the lowest estimation in the London market, as it is almost always heavily salted, and very frequently tastes smoky, fishy, and tallowy." The cattle of this county are a mixed race from the native breed and the English long-horned, and their sheep have been, in some parts, improved by the Leicesters. The Merinos have been introduced within these few years by Messrs. Nowlan, the proprietors of a woollen factory, who have now 600 of the pure race; and they find that both the quality and the weight of the fleece have improved since the sheep were imported. The usual corn crops are raised here, but clover and other green crops not in a suitable proportion. It is the custom to work oxen intermixed with horses, in teams of six, or three pair, deep, the oxen placed foremost. Yet the fallows are better managed here than in any other part of Ireland. Irrigation has been practised for many years, but not extensively. (Sup. Encyc. Brit. Kilkenny.)

Salmon are caught in the rivers, and sent to Dublin packed in boxes of ice. Woollen is the chief manufacture. Messrs. Nowlan and Shaw produce excellent superfine cloths, from an establishment as celebrated in Ireland as that of Owen at Lanark is in Scotland.

7080. KILDARE. 392,397 acres, four-fifths arable, meadow, and pasture, and the rest bog. (*Rosson's Survey of Kildare, 1807. Sup. Encyc. Brit.*)

Part of the *Bog of Allen* and other similar tracts occupy a large portion of the western side of this county. The surface is varied by a number of small hills and gentle declivities, but for the most part it is flat and nearly level; and when viewed from a commanding station, presents a rich, and, on the banks of its rivers, a beautiful landscape. The Curragh of Kildare, extending to about 5000 acres, has been long celebrated for the softness of its turf and the fineness of its pastures. But the climate of Kildare is said to be more moist than that of any other part of Ireland, which, if the statement be correct, is a very unfavorable circumstance, as a clay soil prevails very generally, and much of it is exceedingly tenacious of moisture.

There are a few large estates in Kildare, particularly the Duke of Leinster's, which extends over a third of the county; and several proprietors, according to Wakefield, have from 6000*l.* to 7000*l.* a year. Yet many are less considerable, and property

seems to be more divided here than in most of the other districts in Ireland.

The common *size of farms* is from ten Irish acres to 200, and these farms are frequently held in partnership. Large farms, however, are less rare here than in the arable tracts of the other counties. The leases were formerly for thirty-one years, but are now mostly for twenty-one years and one life. All parish and county taxes are paid by the tenant. With few exceptions, the course of cropping is the same as it has been for a century; viz., fallow, wheat, oats. Potatoes are universally cultivated. Oxen are employed in ploughing, and horses for carriages; but in many instances oxen and horses are mixed together in the plough team, which sometimes consists of six, and never less than four animals. A number of mules are also kept on the farms.

There are several streams and two canals. A woollen manufactory at Cellbridge; and a Catholic seminary at Maynooth, for above 300 students.

7081. KING'S COUNTY. 457,000 acres, half of it bog, mountain, and waste; and the remainder arable, meadow, and pasture, of a medium quality. (*Cooté's Agricultural Society, 1801. Sup. Encyc. Brit.*)

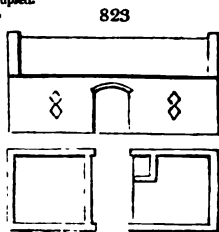
The *Bog of Allen* occupies a considerable tract on the north-east coast, and the mountains are on the side of Queen's County. The soil of the arable land is either marshy gravelly, the former productive in dry, and the latter in moist seasons, but neither of them naturally fertile. Limestone and limestone gravel, the means of their improvement, abound every where. The pastures, though in many parts fine, are not luxuriant; better adapted for sheep than cattle, and very favorable to the growth of fine wool. Much of the mountain district has an argillaceous soil, thickly interspersed with rocks of sandstone, and a deep irremediable bog often occurs at its base; but towards the centre of this range, where limestone prevails, there is much good pasture; and here the base of the hills, which is composed of a stiff clay, produces abundant crops of corn.

Landed property, is in large estates, and many of their owners do not reside; but much of the land is held on leases in perpetuity, and the holders of these form a respectable class. The principal proprietors are Lords Digby, Rose, and Charleville. Farms were formerly very large, not infrequently of the extent of 4000 acres, but their size has been diminished, and such as are considered large, do not now exceed on an average, 400 English acres. Many are as small as twenty acres, though the medium size of the smaller class may be double this. Most of the arable land is tolerably enclosed, chiefly with hedges of whitethorn, which grows here to a great size. Partnership leases and sub-tenancy are less common than in some other parts of Ireland, yet the condition of the tenantry and the peasantry does not seem to be materially more improved. The farm-buildings of every description are generally very bad, the cottages in particular; and yet those who have been long accustomed to these miserable cabins, are said to prefer them to more comfortable dwellings, (*fig. 823.*), which, after having

been erected by some of the proprietors, were for some time allowed to stand unoccupied.

Wheat, oats, barley, and potatoes are the most common crops. The average produce of wheat is no more than sixteen bushels; of barley and oats it is about thirty-two bushels; and of potatoes, only four tons per acre. Both oxen and horses are employed in labor, but the plough is sometimes drawn by only two of either, in a few instances by two heifers, yet this and the other implements are not generally of a good construction. The threshing machine has been in use in this district for about twenty years.

The *leases* were formerly for thirty-one years, or three lives, but the more common period of late is twenty-one years, to which the life of the tenant in possession at the end of it is frequently added. Some tenants hold for lives renewable for ever, paying a renewal fine equal to half a year's rent, or more, on the fall of every life. Modern leases often contain a prohibition against alienating. Nothing is so much complained of among the tenantry, as the mode in which tithes are collected. There are no considerable manufatures, no fisheries, and no minerals worth.



7082. QUEEN'S COUNTY. 384,000 acres, generally of a level surface, three-fourths of which is of a productive soil cultivated, and the rest, bog and waste. (*Cooté's Agricultural Survey, 1801. Sup. Encyc. Brit.*)

Coal of the Kilkenny kind, (7079.) is the only mineral worked; but there is iron ore, freestone, marble, &c. in different parts. The Barrow and Nore are navigable rivers.

Estates are from 5000*l.* to 15,000*l.* a year, and upwards. Some of the most valuable, having been let on perpetual leases, afford a large income. The leases are in the hands of persons who form the middle class of gentry, with clear incomes of from 100*l.* to 800*l.* per annum, obtained from tenants to whom their lands are sublet at rack-rent, and commonly in very small farms. Here, and in King's County, Wakefield observed some

of the best farming in Ireland, with much more attention to a systematic course of cropping, and to keeping the land in good heart. Oxen and horses are used for the plough, the former generally preceeding the latter. A good deal of cheese is made here for the Dublin market. In other respects, the rural economy of this district does not differ materially from that of the Irish counties already described.

The manufatures are linen and coarse woollens, but to no great extent.

7083. CARLOW. 220,098 acres, of undulating surface, with some hills and mountains; the lowlands, a fertile loam, and the uplands, a light gravel; one-tenth in mountains and bogs. (*Wakefield's Statistical Account, &c. Young's Tour, &c. Sup. Encyc. Brit.*)

The minerals are various, but little known.

There are no large estates in this county; and very little minute description of property. The hiring tenant is generally the occupier, except of small pieces. There are some excellent flocks of long woolled sheep. Four sheep of the Irish breed, and five of the English are called a "collop," and three collops are allotted to two acres of the best land. For its dairy, Carlow is not excelled by any county in Ireland. The farmers spare no trouble or expense to procure good cows. From twenty to fifty are generally kept; and, during the season, each cow produces on an average about one hundred weight and a half of butter. The dairy system pursued in Devonshire, Dorsetshire, and some of the northern counties of Ireland, of letting cows to dairymen, is followed here; but this custom was more prevalent when the Catholics could not legally purchase land, as they then employed their capital in hiring cows. The butter made in Carlow is divided into three sorts, according to its quality. The first in point of quality is sent to Dublin and England, and thence exported to the East and West Indies. It is highly esteemed in the London market,

where it is often sold as Cambridge butter. That of the second quality is exported to Spain, and the worst to Portugal. It is all packed in large casks, weighing upwards of three hundred weight.

There is not much wheat grown, and it is not of a bright color, or very good quality; but the barley of Carlow is excellent; according to Young, the best in Ireland. At the time of his tour, it was the only interior county which produced it; and at present more is grown here than in any other part of the kingdom. It is principally consumed by the illicit distillers of Ireland, who use it for the production of spirits. It is also used at Cork, or by the malting houses at Wexford. The potatoes grown in Carlow are excellent. There is little or no flax. The county is tolerably wooded. In the vicinity of Carlow, a great many onions are grown, which are sold all over Ireland.

In Carlow, coarse cloth, reaping hooks, scythes, shears, &c., are made. At Leighlin bridge, is one of the largest corn mills in Ireland, capable of grinding more than 15,000 barrels a year.

7084. EAST MEATH. 617,600 acres, of low, flat, rich surface; a clayey or loamy soil on limestone or gravel, with little wood, few mansions, and only one-twelfth of bogs. (*Curwen's Observations, 1818. Thomson's Survey of Meath, 1802. Sup. Encyc. Brit.*)

The *landed property* of Meath is divided into large estates, a great many of which yield an income of upwards of 2000*l.* a year. These are the most pure let out on leases of twenty-one years and a life; but on some of them there are leases in

perpetuity, which have now become more valuable than the freehold property.

Grazing is, or was, till very lately, a more important object in this county than tillage. Many persons fattened from 500

to 800 cows in a season, besides bullocks and sheep. These they purchase at the beginning of the grass season, and dispose of during the summer and autumn, as they are ready, instead of keeping a regular stock all the year. The pastures are considered too valuable to be applied to the rearing of stock. Dairying is not carried to any extent, and the butter made here is said to be held in little estimation. In some instances, where farms are let out for the dairy, the landlord supplies a succession of cows in milk, horses, and land, and the tenant furnishes labor, utensils, &c. paying at the rate of from six pounds to seven pounds ten shillings per annum, for each cow. The English long horned cattle were introduced many years ago into this district, which now contains some of the best specimens of the breed. The sheep are brought from other counties, and, like the cattle, the same stock is kept only for a season.

Tillage farms are larger here than in most parts of Ireland; but according to Curwen, the system of management is little better than on the small farms of other districts. The houses and fences are for the most part of the worst description, especially the cabins of the farm laborers, which are miserable mud-walled hovels, sunk below the level of the ground adjoining, and occupied by cows and pigs, in common with the family. The principal food of this class is potatoes with churn-milk, and occasionally oat-meal; butcher-meat being rarely used even among the farmers; and, to add to their privations, fuel is very scarce in different parts of the county. An uninterrupted succession of oats and other corn crops for several years is common; in a few instances even for twenty years. The common rotation is wheat, oats, fallow, potatoes, clover, all without the application of manure. It is customary to work horses intermixed with oxen, of which six are generally yoked together, three pair deep, to a very ill-constructed plough; yet, notwithstanding this management, the wheat crops are in some parts excellent.

Manufactures do not attract employment to any considerable part of the population, though here, as in most parts of Ireland, that of linen is carried on to some extent; and also the weaving of cotton. On the Blackwater and the Boyne there are several extensive flour mills.

7085. WESTMEATH. 378,880 acres of surface. With woods, lakes, streams, bogs, and rich grazing lands; in no parts mountainous or flat, but gently undulating or rising into hills of no great elevation; some of these are cultivated to their summits, and others covered with wood, presenting, in several parts, some of the finest scenery in Ireland. (*Wakefield's Statistical Survey of Ireland. Sup. Encyc. Brit.*)

The surface of this district is exceedingly diversified lands; in no parts mountainous or flat, but gently undulating or rising into hills of no great elevation; some of these are cultivated to their summits, and others covered with wood, presenting, in several parts, some of the finest scenery in Ireland. (*Wakefield's Statistical Survey of Ireland. Sup. Encyc. Brit.*)

The principal river is the Shannon, and the lake Lough Ree, full of wooded islands.

There are few large estates, but many gentlemen of moderate fortunes, from 2000. to 3000. a year, most of whom are resident. The leases are commonly for twenty-one years and a life, though, in some places, one or two are for three or four lives. A great many fine long-horned cattle, and long-wooled

sheep occupy the grazing grounds, which extend over much of the best part of the district. Tillage is accordingly upon a limited scale, though more corn is raised than the inhabitants consume; and besides the crops common in other places, flax, hemp, and rape, are cultivated, with clover and turnips; the two latter, however, not generally.

Few or no manufactures.

7086. LONGFORD. 234,940 acres, in great part bog, mountains, and waste; the climate on an average giving 140 dry days in the year. (*Wakefield, &c. Sup. Encyc. Brit.*)

Landed property is in estates of from 3000. to 7000. a year. Leases are commonly for twenty-one years and a life. Farms are, for the most part, very small, where tillage is the principal object; but only a small proportion of the district is under the

plough. It is chiefly occupied in grazing, in which the resident gentry almost exclusively employ the farms which they retain in their own hands. Some linen manufactures.

7087. LOUTH. 210,560 acres, mountainous towards the north, but in other parts undulating and fertile, with little waste land, no considerable lakes, and a great number of gentlemen's seats, of which that of Foster, a distinguished patriot, is the chief. (*Wakefield.*)

Landed property is in estates from 1500. to 8000. per annum. Farms are, in general, larger than in most other parts of Ireland; but there are still many very small; in some parishes, scarcely one above twenty-five acres, and in others they seldom extend to eighty acres. As the land is chiefly occupied in tillage, little attention is paid to the improvement of cattle and sheep; of the latter, though a few are kept on most farms, the number is inconsiderable. Wheat and oats are the principal corn crops, barley being very little cultivated. The other crops are potatoes, flax, and a little hemp. Clover and turnips are almost confined to the farms of proprietors. It is only on these that the general management is good; that of the tenant farmers being, for the most part, slovenly; and their lands requiring heavy dressings of lime and marl to keep them

productive. Yet, many of the tenants are in easy circumstances, well clothed, use meat in their families, and in every thing but their houses and farm buildings, are in a condition superior to that of their brethren in most other parts of Ireland. It is common to renew the leases some time before the old ones expire, so that the tenants are not often changed; but fines are frequently paid on these renewals, which carry away much of the capital that should be applied to the soil. Tithes are very seldom taken in kind; their value is ascertained about the end of harvest, and the tenants grant their notes for the amount, which, though payable in November, is in some cases not exacted till almost twelve months after. The linen manufacture is carried on to a considerable extent.

7088. WATERFORD. 454,400 acres, the greater part hilly and mountainous, but rich and productive on the south-east; the climate so mild, that cattle sometimes graze all the year round. (*Wakefield, Curwen, &c. Sup. Encyc. Brit.*)

Some very large estates, of which the most extensive belongs to the Duke of Devonshire. Leases are commonly for twenty-one years and a life; and on the banks of the rivers, where the land is most valuable, farms are small. According to Wakefield's information, "in this county, when the eldest daughter of a farmer marries, the father, instead of giving her a portion, divides his farm between himself and his son-in-law; the next daughter gets one-half of the remainder, and this division and subdivision continues as long as there are daughters to be disposed of. In regard to male children, they are turned out into the world, and left to shift for themselves the best way they can." The rent is chiefly paid from the produce of the dairy, which is conducted on a greater or smaller scale over all the county, and from the pigs, which are partly fed upon its offals. Some of the dairy farmers, most of whom are in easy circumstances, pay 1000. a year of rent; and a great deal of butter is

made, even among the mountains, where small cows, suited to the nature of the pastures, form the principal stock. In the neighborhood of Waterford, cows were let for sixteen pounds, eighteen pounds, and even twenty pounds per year. There are very few sheep, and those of a bad description; and, comparatively, but a small portion is in tillage. Where flax is used as a manure, it must be brought from a distance, as there is no limestone to the east of Blackwater, and it costs upwards of five pounds for an acre. Oak and ash are the principal trees on the banks of this river, and extensive plantations of timber trees have been formed in various parts. Fences so much used as ruel, that whole fields are kept under this shrub for the purpose.

Hops are an important branch of trade at Milford Haven; glass and salt the principal manufactures.

7089. CORK. 698,882 acres, of greatly varied surface; bold, rocky, and mountainous on the west, rich and fertile on the south and east, romantic and sublime in many places, and one-fourth part waste. (*Wakefield. Townsends Survey of Cork, 1810. Sup. Encyc. Brit.*)

The climate is mild, but a very general opinion exists that it is changing for the worse.

The rivers of this county flow with rapidity for the most part; a circumstance unfavorable to their being rendered navigable, but presenting many eligible situations for the erection of machinery.

The most useful fossils are limestone, marble, and slate; coal and ironstone have been discovered, but not worked to any extent.

Estates are generally large; tillage farms are very small, seldom above thirty acres; and, when they are larger, often held by lease, and the shares of each further diminished by the common practice of dividing the paternal possessions among the sons. The leases used to be for thirty-one years, or three lives; but of late the term has been reduced to twenty-one years, or one life; and the farms, instead of being let out to middlemen, who used to raise the land in great portions to co-tenants, are now let to small tenants, or are now held in most cases by the occupier from the proprietor himself. There is here the usual minute division of tillage lands, cultivated by the spade in preference to the plough; the usual dependence on potatoes, as the common and almost exclusive article of food, with miserable cabins, crowded with poverty and idleness. The crops are potatoes, in favorable situations succeeded by wheat,

and oats, for one or more years; sometimes barley follows the wheat. Flax is cultivated in many small patches. Hemp very rarely. Turnips and clover are seldom to be seen on tenanted lands. Sea-sand, sea-weed, and lime, form a useful addition to the stable and farm-yard manure; which is, however, in many cases, allowed to be washed away by the rains, and greatly reduced in value by careless management. Paring and burning is practised in every part of the county, as an established mode of preparation for the first crop in the course. The implements of husbandry are generally bad: the common Irish plough and harrows, seldom furnished with iron tires, drawn by horses or mules, and in a few instances by oxen; wheel carriages have become common. A considerable number of dairies are kept in the vicinity of the city of Cork, where the produce, in the shape of butter and skimmed milk, finds a ready market. In general the cows, which are chiefly of the Friesian breed, are let out to a dairyman, at a certain rate for each, by the year; yet, many farmers conduct the business of the dairy themselves. The average number of cows in a dairy may be from thirty to forty. A few sheep are kept on every farm, commonly in feters, and upon the most worthless pastures. Proprietors have introduced stranger breeds, and then them to answer; but sheep can never become an object of importance in a district where farms are so small.

Tithes, of which no inconsiderable part are lay property, are generally paid by a composition with the farmers. The usual mode is to have them valued before harvest, and to appoint days of meeting with the parishioners, for the purpose of letting them.

7090. TIPPERARY. 1,018,940 acres, diversified with heaths, mountains, and fertile vales; of which the Golden Vale is among the richest land in the kingdom. The climate so mild, that cattle graze out all the year. (*Wakefield, &c. Sup. Encyc. Brit.*)

Miscellaneous. Slate, lead, and coal are worked.

Estates are of various sizes, some of them very large, but a greater number of a medium extent, worth from 4000*l.* to 6000*l.* a year. Of the proprietors, the influence of Lord Lansdowne is by far the most considerable, though several others have estates worth from 10,000*l.* to 15,000*l.* a year and upwards. The graziers here, as in Devonshire, have leasehold properties, frequently of much greater value than the freeholds, of which, also, they often become the purchasers. Properties of this description, worth from 2000*l.* to 4000*l.* a year, are very common.

Tillage farms, however, are generally of small extent, one of ninety Irish acres being thought large; yet the management is, in many instances, more respectable than in most other

7091. LIMERICK. 683,900 acres, of low laying fertile lands, surrounded by higher grounds. (*Wakefield, &c. Sup. Encyc. Brit.*)

Landed property is in large masses, generally let to tacksmen, on long leases, and sub-let almost ad infinitum. The land seems to be of greater yearly value than in most parts of Britain at a distance from large towns; for, according to Wakefield's information, the green acres would have let, in 1808, for three guineas the Irish acre, or almost forty shillings the English. Considerable farms brought five guineas the Irish acre, and in some instances more. The rent of the mountain land had increased in a still greater proportion than the grazing and corn farms. One grazier held land of the value of 10,000*l.* a year, and in one season slaughtered in Cork, 800 head of cattle. Many of the best long-horned cattle of the United Kingdom are fattened here, and also a considerable number of sheep.

7092. CLARE. 771,365 acres, nearly half productive land, and the remainder moors, mountains, and bogs, with more than 100 lakes interspersed. The climate, though moist, is not unfavorable to health and longevity; fevers, which sometimes prevail to a great extent here, being occasioned chiefly by the dampness of the houses, and inattention to domestic and personal cleanliness. (*Dutton's Survey of Clare, 1808. Sup. Encyc. Brit.*)

Limestone abounds, and coal, ironstone, black marble, lead, &c. have been found, but not worked.

Landed property is in a few large estates, of which the most noted was that belonging to the Marquess of Thomond's heirs, lately sold and divided.

The size of farms varies greatly. Those under tillage are from one or two acres to fifty, but of the latter size there are few. Grazing farms extend from 100 to 800 acres, several of which, and sometimes in distant situations, are held by one individual. Frequently several persons join in the occupation of an arable farm, and have about ten acres each. The general terms of leases from proprietors, is for three lives or thirty-one years; sometimes, but not often, for three lives and thirty-one years; twenty-one years or one life, and twenty-one years and a life. The tenure of under tenants is variable, and often arbitrary.

All the different species of grain are cultivated with considerable success. Rape and flax, the former chiefly for its seed, and the latter for home manufacture, are sown to a moderate extent. Potatoes occupy a part of every farm, and their culture is conducted with more care and judgment than that of any other crop, though at a greater expense of time and labor than would be thought necessary in most other places. In regard to the kinds of crops cultivated, the greatest defect is in what are called green crops, corn being, with potatoes, the chief and almost the only objects of attention to the arable farmer; and turnips and cultivated herbage being either grown on a very small scale, or, as is the case throughout the greater part of the county, altogether disregarded or unknown. The corn crops thus necessarily follow each other, until the soil is exhausted; and where extra manure, such as sea-weed and sea-sand, both of which are used as manure with good effect, cannot be procured, it must be left in an unproductive state for several years afterwards. Potatoes are in most cases planted upon land that has been prepared by burning, and the same crop is sometimes taken for two years more without manure; in the fourth year wheat follows, and then repeated crops of oats, as long as they will replace the cost of seed and labor.

The implements in common use are generally rudely con-

The principal manufactures are sail-cloth, duck, canvases and drilling; osenburghs for negro clothing; coarse woollens; spirits at several large distilleries in Cork; and gunpowder in the neighborhood of the same city, the only manufactory of that article in Ireland; it belongs to Government.

parts of Ireland. But the principal business is grazing, every variety of this kind of land being found here. Leases are commonly for twenty-one years and a life. The cattle, which are long-horned, may be ranked with the best in Ireland, and many of the fine flocks of long-wooled sheep are not inferior, in Wakefield's opinion, to those of Leicestershire. The rich lands produce a kind of flax, very different from that which is raised in the north; it grows to a great height, and appears to be exceedingly well adapted for sail-cloth.

The manufacture of broad-cloth is carried on to some extent at Carrick; and that of linen, worsted, and coarse woollens, as branches of domestic industry. But the wealth of this extensive district chiefly consists in its cattle and sheep, corn, and other land produce.

Two year old wethers sold then, without their fleece, at from 2*l.* 10*s.* to 3*l.*

Only a small proportion of the land is in tillage; the produce of this, and some of the adjacent counties, in proportion to the soil, is stated by the same author to be at a medium; of wheat ten, bear seventeen, barley twelve, oats nine, and potatoes ten. Hemp was formerly cultivated extensively on the rich low grounds, called the Carcasses, on the banks of the Shannon, but this tract is now occupied in grazing. Flax of an excellent quality for sail-cloth, is still grown in several parts. The common term of leases is thirty-one years and three lives. Great part of the provision and corn trade is possessed by the city of Limerick.

structed, and imperfect as well as expensive in their operation; in many parts, even where the soil is light and dry, the plough is drawn by four horses abreast, with traces of rope and collar of straw. But from the roughness of the surface, the poverty of the tenantry, and the minute division of farm lands, the spade is much more extensively employed than the plough, over all the arable land of this county.

The pastures of the Carcasses or low grounds, on the river Shannon and Fergus, are equal to the fattening of the largest oxen. This rich tract extends from Paradise to Limerick, about two miles, and is composed of a mixture of about 30,000 acres, of a deep, dark colored soil, over a bluish or black clay, or moory substratum; producing, owing to the incidence of its occupiers, along with the most valuable herbage, a great quantity of rushes and other useless weeds. The rent of this land for grazing, was several years ago as high as 6*l.* per acre, equal to about 3*l.* 10*s.* per English acre, and for meadow, is many instances, much more. These meadows are said to produce at the rate of more than four tons of hay the English acre. The cattle of this county are almost all long-horned, good milkers, and very hardy. The sheep have been greatly improved in shape, by crosses with Leicester rams, but there is a general complaint that the quality of the native wool has been deteriorated. A vast number of mules are bred here; asses are very generally employed by the poorer classes; but little attention is paid to the breed of horses, which has degenerated.

Clare was formerly noted for its orchards, and for cider of a very fine quality, made from the celebrated corkage apple, which is still found near the small town called Six Mile Cross. "An acre of trees," says Young, "yields from four to ten hogsheads per annum, average six; and, what is very uncommon in the cider counties of England, yield a crop every year. It does not grow from the latest accounts, that any considerable quantity of this cider is now produced here, though what there is, seems to maintain its former character, and is held in great estimation.

Manufactures are yet in their infancy. All the linen made in the county is used for home consumption.

7093. KERRY. 1,128,320 acres, more than three-fifths mountainous and waste; the sea-coast and islands being the most westerly land in Europe. Some of the mountains 3000 feet high. (*Smith's History of Kerry. Wakefield. Sup. Encyc. Brit., &c.*)

The mountains are chiefly occupied with young cattle and goats; sheep, apparently the most profitable animal in such situations, are neither numerous nor of a valuable kind; and the little cultivation to be found here is so generally performed with the spade, that, in some entire parishes, as Young assures us, there was not a single plough.

The prevailing soil in the low grounds is clay, of different qualities; some of it seems to be a species of pipe clay, and other sorts might be converted into bricks and earthenware.

Estates are very large, both in extent and value, some of them, according to Wakefield, worth 30,000*l.* a year. Leases are in general for thirty-one years and three lives, and a considerable portion of the whole county is let to partnership tenants. Few of the tenants in the north quarter about Kerry-head oc-

cupy so much land as to require them to employ laborers; they pay their rents by the sale of butter and pigs, and by turf which they carry to Limerick. It is the practice for farmers to hire large tracts, which they stock with cows, and these cows are then let out to dairymen upon such terms as leave them but a very small return for their labor. The best corn land is about Tralee, and towards Dingle, where more flax is raised than in any other part of the county.

The principal articles which Kerry exports for export are its raw produce, beef, butter, and tallow. It is said that more corn than is necessary for its home consumption, and carries on no manufacture for sale, but that of coarse linen, which is only on a small scale.

7094. ROSCOMMON. 556,847 acres of flat surface, in some places sprinkled with rocks, and, in many, interrupted by extensive bogs; the richest land on limestone, and adapted either for aration or pasture. (*Wakefield. Sup. Encyc. Brit.*)

Coal and iron works were formerly carried on, but are now neglected.

Estates were once very large; but they have been broken down in some instances, by the granting of leases in perpetuity, a practice which has given rise to a class of landholders, interposed between a few great proprietors on the one hand, and a numerous body of cultivators on the other.

Some of the best long-horned cattle and long-woolled sheep in Ireland fed, but there are few dairies. During the late war, its fine green pastures, under this management, afforded a very ample rent, and tillage was therefore conducted on a small

scale; but the plough has been more in request since the peace, both here and in other parts of Ireland; and the soil of such rich grazing lands, requiring nothing more than the common operations of tillage to yield large crops, the growth of corn throughout Ireland has been greatly increased; yet, within these few years, agriculture was here in a very backward state. "In Roscommon," says Wakefield, "I heard of horses being yoked to the plough by the tall, but I had not an opportunity of seeing this curious practice. I was, however, assured by Denis French, that it is still common with two-year-old cattle in the spring." Potatoes, oats, and flax, are the principal crops.

7095. GALWAY. 1,659,590 acres of varied surface; above a third part bogs, mountains, and lakes, and very unproductive and thinly inhabited. (*Dutton's Survey of Galway, 1894. Wakefield. Sup. Encyc. Brit., &c.*)

The east part of the county is flat, warm, and fertile; with many reeds, though none of note. Rivers and lakes abound. Lough Reagh and Lough Coutra are fine pieces of water; the latter is said to possess all the beauties that hills, woods, and islands, can impart to the features of a landscape.

Several large estates, affording an income of from 5000l. to 10,000l. a year, and upwards. One of these, the most extensive in the British Isles, stretches along the sea-coast for seventy miles. Only a small portion is held by absentees. A full third of the land is let on partnership leases, to an indefinite number of persons, very often twenty, who by law are joint tenants, but entitled to the benefit of survivorship. The leases are commonly for three lives, or thirty-one years. "These people," says Wakefield, "divide the land and give portions to their children, which consist of a fourth or a fifth of what they call 'a man's share,' that is, of the land which originally belonged to one name in the lease. A certain portion of the whole farm, or take, as it is styled, is appropriated for tillage, and this portion is then divided into lots, perhaps twenty or thirty. These lots are again subdivided into fields, which are partitioned into small lots, each partner obtaining one or two ridges; but these ridges do not continue in the hands of the

same occupier longer than the time they are in tillage. The pasture is held in common; and the elders of the village are the legislators, who establish such regulations as may be judged proper for their community, and settle all disputes that arise among them. Their houses stand close to each other, and form what is here called a village."

The cattle of Galway are long-horned, and of an excellent description, fully equal, in the opinion of Wakefield, to any in England. But sheep form the most valuable part of their live stock; "some of the first flocks in the world," says the same writer, "are to be found in this county." The crops are the same as in other parts of Ireland, but potatoes are not cultivated to so great an extent. They plant potatoes on an oat stubble, or on ley that has been burned or manured, and follow with wheat, barley, or oats; the latter kind of grain is not unfrequently taken after wheat and barley. Faring and burning are seldom used. The greater part of the rent of some of the estates on the shore is paid from kelp, which is prepared in large quantities.

In common with the greater part of Ireland, Galway employs some of its people in the linen manufacture, and it seems to be the only manufacture in it worth notice.

7096. MAYO. 1,496,460 acres, in great part mountains, bogs, and lakes; half heathy mountains, with valleys very fertile, but neither woods nor plantations, excepting on one or two estates. (*M^r Parlan's Survey of Mayo, 1802. Wakefield. Sup. Encyc. Brit.*)

Many valuable fossils: iron formerly made, but discontinued for want of fuel. Excellent slate; and petroselinus semilucidus similar to what is used in the English potteries.

The estates worth from 7000l. to 20,000l. a year; but their extent, owing to their containing a great proportion of waste land, is still greater than in the ratio of their value.

The size of farms varies with the nature of the soil and surface, but, though several hundred acres are sometimes let out in one farm, yet, as the farms are commonly held in partnership, the space allotted to each tenant is generally only a few acres. As each of them keeps a horse, it is computed that there is one for every ten or twelve Irish acres. The leases are for different periods, fifteen years, twenty-one years, and one, two, and sometimes three lives, or thirty-one years.

Agriculture is in a very backward state. The plough commonly drawn by four horses abreast, is of the worst description, and the harrows are often furnished with tines of wood, instead

of iron. It is still the practice, in the mountain district, to yoke the horses by the tail. But, in some of the baronies, the plough is seldom or never employed at all, the tillage being performed by the spade; and in others they use the spade in cultivating potatoes, and the plough only for corn. Yet potatoes, oats, and, on the sea coast, barley, are sown to a considerable extent, and also flax. Wheat is cultivated only in particular spots, and chiefly by proprietors, a few of whom have also introduced turnips, pease, beans, rape, and caltrops. There is some excellent grazing land for cattle in the barony of Trawley, and good sheep pastures in Kilmain. Some graziers hold 3000 Irish acres. The English long-horned cattle, which were imported by the principal proprietors, have greatly improved the native breed.

The habitation of the laborers, or cottars, are in general very wretched, and shared by them with their cow and pig.

7097. LEITRIM. 386,560 acres, one half bog, waste, and water, and the remainder dark fertile soil, incumbent on limestone. (*M^r Parlan's Survey of Leitrim, 1802. Wakefield. Sup. Encyc. Brit.*)

Coal, ironstone, lead, copper, &c. are found, but not worked. *Estates* large, and nearly all the great proprietors are absentees. The leases are commonly for three lives, or thirty-one years. Agriculture is here in a very low state. The tillage farms are small, seldom exceeding fifty or sixty acres, and these are almost always subdivided among a number of tenants. The plough is very little used. The most common implement is the

batter is made throughout the district. The sheep are of the native race, small, and but few in number.

About the beginning of the eighteenth century, Leitrim is said to have been almost a continuous forest. There is little wood in it, and no considerable plantations. The proprietors, however, have of late paid some attention to this method of improvement, and several large nurseries have been established for the sale of forest and other trees.

There are several bleachfields, and some coarse potteries; and a number of people are employed in weaving. But the linen made here, as well as the coarse woollen goods, is chiefly for the use of the inhabitants themselves. The houses of the lower classes are of the worst description; even the more recently erected farm buildings, including a little barn and cow-house, do not cost more than ten or twelve pounds. Turf is their only fuel, and potatoes and oats bread the chief articles of food, meat being used on extraordinary occasions only.

7098. SLIGO. 465,280 acres, a third part bogs, mountains, and waters, and the remainder fit for tillage or grazing. (*M^r Parlan's Survey of Sligo, 1802. Wakefield. Sup. Encyc. Brit.*)

The subsoil of a considerable tract a gray flag, provincially known, unfavourable to agriculture. Numerous streams and lakes; the wooded islands and scenery around Lough Gill, very striking. On the Sligo and Moy, considerable salmon fisheries; trout abound, and white fish on the shores.

Estates of almost every size. A few are worth from 5000l. to 9000l. a year; yet, a considerable proportion of the county is divided into small properties. The principal proprietors are absentees. Farms vary in size, from three Irish acres to 500; the larger farms, however, are not held by individual tenants, but in partnership. The leases are for thirty-one years and three lives; and, in some instances, for sixty-one years and three lives, being, in general, longer here than in other parts of Ireland. Tillage farming is still in a very backward state. The plough is worked by three or four horses yoked abreast, directed by a man who walks backwards before them. Oats,

barley, and potatoes, are the principal crops. Of the two former, the largest proportion is consumed in illicit distillation, which, within these few years, was carried on in almost every part of the county. It was to the sale of the spirits that many of the small tenants looked as the means of paying their rents. In some parts, both cattle and sheep are kept in considerable numbers, and a great deal of butter is exported from the town of Sligo; but the land occupied in this way bears but a small proportion to the whole; to grow corn being the principal object. Limestone and limestone-gravel, which are in abundance in most places, are in general use as manures; also malt, and, on the coast, sea-weeds.

The necessaries for export are linen, salt, and hamp. The cabins, food, fuel, and clothing of the lower classes, seem to be as uncomfortable as in any of the Irish counties.

7009. CAVAN. 469,957 acres, almost entirely covered with hills; the surface, soil, and climate, being alike bleak and uncomfortable. (*Cooté's Statistical Account. Wakefield. Sup. Encyc. Brit.*)

Near Farnham, the appearance of the country is favorable; the lakes there are picturesque, and communicate with each other by a river. The fossils are various, but neglected.

Two estates are of 30,000 and 26,000 acres, besides those there are none of very great extent. Nearly the whole of the land is under tillage, but the agriculture in every respect is very bad. The size of the farms is from 50 to 100 acres, but these are generally subdivided into farms of from two to twenty acres, which are re-let to the manufacturers or "cottagers," who pay a high rent for them, by means of their other employments. Their principal object is to raise a sufficient quantity of oats and potatoes to feed their families, and of flax to give employment to the women and children. Most of the land is dug with the spade, and trenched; where the plough is used, they put three or four horses to it; and when Young visited the county, he found that all over it, the horses were yoked to the ploughs and harrows by the tail; that practice, however, is now disused. Almost the only grain sown is oats, which are reckoned to be in the proportion of seventy to one, to all other grain; there is scarcely any wheat. In 1869, there were 4300 acres of flax, from which 6500 bushels of seed were saved.

Though the very tops of the hills are grain, yet it does not appear that this county produces more grain than is necessary for its home consumption; nor has the bounty on the inland carriage of corn to Dublin, increased the very trifling quantity brought to that market. From the coldness and moisture of the climate, all the corn of Cavan is obliged to be kiln dried.

The stock farms generally consist of about 100 or 150 acres, the farmers buy young cattle, and sell them again without fattening; a few, however, fat bullocks or sheep, but the latter are very poor. There are very few dairy farms, though from these, as they are in the richest parts of the county, a good deal of butter is sent. Many pigs are kept by the cottagers, and near all the cabins are to be seen goats tethered to the tops of the banks, or "ditches," as they are here called, which divide the fields.

Cavan was formerly celebrated for its extensive woods, and trees of an immense size; but at present it is, in general, bare of timber, except near Kilmore, Farnham, and a few other places. Wakefield remarks, that the ash is confined to parts of the county, and to Tyrone and Fermanagh.

The linen manufacture is the staple.

7100. FERMANAGH. 450,000 acres, in great part covered by water, and much of the rest of the surface rugged and mountainous, but better wooded than other parts of Ireland. (*Wakefield. Sup. Encyc. Brit.*)

The oak grows in the hedgerows; beeches come to a large size, and also the yew, near Lough Erne; and fir, oak, and yew, are found in the bogs. The grand nature in the natural scenery of this county is Lough Erne, which occupies about one-eighth of the surface, and contains more than three hundred islands. It contains most of the fish that are found in other fresh water lakes, and is noted for its salmon and eels, particularly the latter. Four of the eel weirs near the falls of Beech, afford a rent of 1000. each.

Estates are large, three proprietors mentioned by Wakefield, have 15,0000. a year each, and other three from 60000. to 70000. The leases are most commonly for twenty-one years and a life.

In the northern part of the county, the farms are larger and more productive than in most other parts of Ulster. Oats, barley, potatoes, and flax, are the principal crops; very little wheat, clover, or turnips being cultivated, except in small patches near the towns. The high grounds are chiefly occupied in rearing cattle, and much of the better pastures with dairy stock. There are no large flocks of sheep, and their breed of this animal is of a very inferior description.

Linen seven-eighths wide, is manufactured to some extent, and there are several bleach-works, which finish for sale the linens sent to England. Illicit distillation is said to be very general.

7101. MONAGHAN. 325,760 acres of low grounds, with detached hills, and a considerable space occupied by bogs and small lakes. (*Cooté's Survey of Monaghan, 1801. Wakefield. Sup. Encyc. Brit.*)

There are a few large estates, but the greater part small ones, many of which are let to the manufacturers at the rate of 17s. per acre of labor. A few years ago, there were only 17s. freeholders of 500. and upwards, out of nearly 6000, most of the considerable proprietors are absentees, and very little of the landed property is in the hands of Catholics.

Farms were so small, a few years ago, as not to average ten Irish acres over the whole county; and the management, as might be expected, was exceedingly unskilful and unproductive. The spade was used much more than the plough; the latter being an implement which, with the team required to work it, and the party to attend and direct it, could be brought into action only by the united efforts of several tenants. The

general term of leases is twenty-one years, and a life, or sometimes three lives. The principal crops are oats, potatoes, and flax, with wheat and barley in a small proportion; these last, however, extend over a much greater tract now than they did a few years ago. They make a good deal of butter, but there are no large dairies. Goats are in greater numbers than sheep, which is of itself a sufficient proof of the low state of its agriculture.

The linen manufacture is said to have averaged twenty years ago, about 800,000. a year. It is carried on by the greater portion of the inhabitants of both sexes, all the small farmers being also weavers.

7102. TYRONE. 813,440 acres in great part mountainous, and containing, among other mountains, Beasy Bell and Mary Gray, celebrated in song. The territorial value of this inland and northern district is much inferior to that of most others. (*M'Farlan's Survey of Tyrone, 1802. Sup. Encyc. Brit.*)

Various valuable fossils found, but not worked: the best pottery in Ireland, near Dungannon. Lough Neagh, the largest lake in Ireland, covers 110,000 acres, but is not celebrated for its scenery.

Estates are of very great extent, many of them worth from 50000. to 70000. a year, and the productive or arable land divided into very small farms, not often exceeding twenty Irish acres. The chief proprietors are the Marquess of Abercorn, Lords Belmore, Northland, and Mountjoy. The leases are for various periods, thirty-one years and three lives, three lives, and twenty-one years and a life. On some estates the land passes through the hands of middlemen, in portions of various sizes, till it reaches the small cultivator; for the most part, in very minute subdivisions. It is customary for several persons to be concerned in one township, which is held in what is called rundale, the cultivated land being divided into shares, which are changed every year, and the cattle pasturing in common, a system utterly inconsistent with profitable occupation, or the amelioration of the soil and live stock. The cattle and

sheep are accordingly of a very inferior description; and the latter, which are not numerous, may frequently be seen tethered upon the small patches of herbage which are interspersed among the shares of these partnership concerns. The tillage land, too, is more frequently stirred with the spade than the plough; and where a plough is used, the team, consisting of horses, bullocks, and even milch cows, must be supplied by the contributions of three or four neighbors, who unite their means for the purpose, each attending the operation, but his poor animal should have more than his proper share of the labor. Potatoes, oats, and flax, are the principal crops.

The linen manufacture is carried on to a great extent, and the potatoes and collardies employ a considerable number of hands; to which we may add illicit distillation, which prevails throughout all the north-western counties of Ireland. The food of the lower classes is oat-meal and potatoes; wheaten bread and butcher meat never being used but on extraordinary occasions.

7103. DONEGAL. 1,100,000 acres of ragged, boggy, and mountainous surface, with a cold, wet climate, and neither woods nor plantations to shelter from the blast. (*M'Farlan's Survey of Donegal, 1802. Wakefield. Sup. Encyc. Brit.*)

Landed property is in few hands.

Agriculture is in a very backward state in Donegal. The use of the plough is confined to a small proportion of the cultivated land, and is generally of a bad construction; spade labor is preferred in most places. Barley is the chief grain crop, and it is almost all used in distillation; oats are only grown for home consumption, and wheat is confined to a few favorite spots. There are only two flour mills in the county. The culture of flax is considerable in the barony of Raphoe, and is extending even in the mountain districts. Potatoes are cultivated everywhere; turnips, clover, and other green crops, are almost unknown among the tenantry. Village or partnership farms still abound, but farms now begin to be let to individuals as separate holdings. In the low country they are from ten to fifty acres in extent, and from 40 to 500 in the mountains. The fences are commonly nothing better than ditches, with banks of turf or clay, so that the cattle require to be herded while the crops

are growing, and in many parts they are allowed to graze promiscuously as soon as the crops are removed. Sea-weed and shell-sand are used as manures, but very little lime, or lime-stone gravel. The practice of piling and burning, so common in many parts of Ireland, is seldom resorted to in this county. Leases are granted for twenty-one years and a life.

The staple manufacture of Donegal is linen. Women are much employed in knitting stockings. Kelp is prepared along the north-west coast; and, during the fishing season, three or four salt-pans used to be kept in full work. But whisky, says Dr. M'Farlan, particularly in the mountain region, and all around the coast, is the chief manufacture. "It is by rearing their barley into this beverage that they provide for one half year's rent." This is, therefore, a tax raised by the rich on the morals and industry of the poor.

7104. LONDONDERRY. 510,790 acres, generally mountainous, fertile and beautiful in the valleys, and containing every variety of soil. (*Sampson's Survey of Londonderry, 1802. Wakefield. Sup. Encyc. Brit.*)

Landed property. With the exception of lands belonging to the church, and the towns of Londonderry and Coleraine, and certain portions reserved by the Crown to be at a future date erected into freeholds, the whole of Londonderry was granted by James I. to the twelve companies or guilds of London. The estates are therefore held from these companies, either in perpetuity, or on determinable leases. The principal proprietors or leaseholders are Lords Waterford and Londonderry, Conolly, Ogilby, and the families of Beresford and Ponsonby.

The average size of farms is from five to twenty Irish acres, or at a medium little more than fifteen acres English. Whole districts are sub-divided into patches of seven or eight acres, but in a few situations there are farms of upwards of 300 acres.

7105. ARMAGH. 290,786 acres of varied and rather interesting surface of mountain, plain, and bog; with rivers, streams, and lakes, and a climate mild for the latitude. (*Cooke's Survey of Armagh, 1804. Wakefield. Sup. Encyc. Brit.*)

Markets of an excellent quality, and of great beauty, is wrought in Armagh.

Estates in this county are not large, there being only seven or eight proprietors who possess them of the annual value of from 6000 to 10,000. The farms also are small, being commonly from five to twenty acres, and seldom exceeding forty or fifty.

Neither the arable nor the pasture husbandry of this county present much that is worthy of notice. Potatoes, flax, and oats, are the chief produce of the arable districts; and those are cultivated in a very rude and inferior manner, in consequence of the ignorance of the farmers, and their want of capital.

There are no extensive dairy farms, nor are there any farmers exclusively in this branch of husbandry; nevertheless a considerable quantity of butter is made here. One hundred weight per cow is considered as the average produce. The proportion

7106. DOWN. 558,289 acres, of which one-eighth are mountainous and waste, the remainder hilly and productive, cultivated by small manufacturers, and neat white-washed habitations. The climate is variable, but not subject to extremes. (*Duboulevard's Survey of Down, 1802. Sup. Encyc. Brit.*)

Landed property. There are some large estates, though in general it is much divided, and has all the different gradations, from the most opulent nobleman to the tenant in perpetuity who farms his own land. Most of it is freehold. The rental was above the average rental of the best counties in Scotland, as returned to the commissioners of the property-tax in 1811.

The farms may be divided into two kinds; the first, such as are possessed by farmers who have recourse to no other branch of industry; the second, such as are held by weavers and other tradesmen. The former run from twenty to fifty, and, in some instances, so far as 100 acres; the latter are of every size, from one to twenty acres. The rent is always paid in money; personal services are never exacted. Some leases are for lives and years, others for lives only. Pences consist chiefly of a ditch and bank, without quicks of any kind, or sometimes with a few plants of furze stuck into the face of the bank; but dry-stone walls are frequent in the stony mountainous parts. Great improvement has been made in its agriculture within these twenty years. The rearing mills and two-horse ploughs have been introduced. But it cannot be said that a good system prevails generally, which the small size of the farms, indeed, render impracticable. A regular rotation is rarely followed in the crops; fallows, clovers, and turnips, are upon a very small scale; and from the greater part of the arable land, it is still the practice to take crops of grain in succession, only partially interrupted by potatoes, flax, and peas. Oats, the principal

7107. ANTRIM. 692,059 acres; on the east and north mountainous, destitute of plantations, and abounding in bogs; the other parts more level and fruitful, and the climate drier than in some other counties. (*Newenham's Statistical Survey. Wakefield. Duboulevard's Survey of Antrim, 1812. Sup. Encyc. Brit.*)

Minerals. Besides basalt, limestone, gypsum, coals, fossil-wood, or wood-coal, sandstone, &c. are found. The fossil-wood, or wood-coal, in most places, is covered with columns of basalt, and is curious as explanatory of the origin of coal. Notwithstanding the compressed state in which it is found, the bark and knots are quite distinct, and the rings denoting the annual growth of the wood may be counted. In some instances the roots of the trees may be traced. Of the only two coal mines which are wrought in the province of Ulster, there is one in Antrim, at Bally Castle. The coals are bituminous, and of a bad quality; a great part of them are exported.

Landed property. Estates are in general freehold, being either immediate grants from the Crown, or held under those grants. The exceptions are the properties under the see of Connor. Some of the estates are very large. The Marquess of Hertford, and the Antrim family, possess the fee of the major part of the county. The former has 54,000 *gross acres*; that is, land capable of tillage, and independently of bog and mountain. Most of the Antrim estate is let on perpetuity, in farms worth 2000*l.* or 3000*l.* per annum. The other great proprietors are the Marquess of Donegal, Lord Templeton, and Lord O'Neill. The estate of Lord Templeton, however, is only leasehold under the Marquess of Donegal, who lets his land for sixty-one years and a life, but renews at the end of a few years for a price.

The farms are in general very small. The principal feature in the tillage system is the potatoe fallow. The small size of the farms, and, in some places, the richness of the soil, precludes

The leases are for a great many different periods, though most commonly for twenty-one years and one life.

The principal crops are potatoes, barley, oats, and flax. Wheat is not in general cultivation. Turnips are very rare, and sown grasses and clovers far from being common. No uniform rotation of crops is recognised in practice, but it is usual to take two crops of oats successively, and sometimes flax the year following. Flax is the predominating plant in the meadows, where it grows spontaneously with great luxuriance. The live stock presents nothing worthy of particular notice. Grazing grounds are not extensive, and there are few dairies. On the east side of the Bann there are two extensive rabbit-warrens. The principal manufacture is linen; the value exceeds half a million sterling, besides brown or unbleached linens.

of the milch cows to the size of the farms is, on small farms under five acres, one cow; on farms exceeding five, and under ten acres, perhaps two cows, seldom more. A considerable number of cattle are reared. From the low country they are sent to the mountain farms, and frequently afterwards sold in the Scotch markets. They are in general of a small stunted breed. The native sheep are an awkward breed; the wool coarse, and in small quantity; very little of it is exposed to sale, there being hardly sufficient for domestic use. Goats, swine, and poultry abound. Wild geese, swans, wild ducks, and several other species of aquatic birds, are indigenous to the lakes and rivers. Formerly bees were much attended to, but at present they are neglected.

The roads in general are bad; and, what is extraordinary, the turnpikes are the worst, and the cross roads the best. The principal manufacture is that of linen.

grain, are grown on all soils; barley is usually sown after potatoes, and also wheat to some extent on the coast. Of flax they sow four bushels an Irish acre, and the medium produce is fifty stones. Rye and peas occupy but a small space. Lime, marl, shelly-sand, and sea-weed, are used as manures. Faring and burning are confined to the mountains.

There are extensive meadows on the banks of the Bann and the Lagan; but the soil, except on the mountains, is thought to be better adapted to tillage than pasture. A good many beasts are fattened, but cows are the prevailing stock, kept in small numbers on every farm. They are long-horned, thin in the sides, and deep in the belly, but yield much milk when well fed, and each of them from 60 to as much as 120 pounds of butter in the year, or about two-thirds of the medium produce of the butter dairies of England. Sheep, in flocks of any size, are confined to the mountain districts. They are very small, many of them, when fat, not weighing more than seven or eight pounds a quarter. On the low ground there are a few, seldom exceeding half a score, on almost every farm. A great number of hogs are fattened; many of them brought from the west of Ireland, and brought from the west of Ireland. The dry hills of this county are covered with heath and odoriferous herbs, are well adapted to bees, but the number of hives has greatly decreased within these twenty years.

The principal manufacture is linen, which is carried on in all its branches.

the use of the ordinary means of culture, and therefore a part of the land is dug with the spade. The quantity of potatoe-land is regulated by the quantity of manure that can be collected. After potatoes, flax is sown, and the quantity of flax ground is regulated by the ability to purchase seed. A crop of oats furnishes the regular rotation. When the ground is exhausted, it is turned to rest, that is, it is sown to the till it is covered with natural grass. Such is the most general plan of husbandry pursued in Antrim. In those parts where the farms are too large for the spade culture, the land is ploughed by three or four neighbors uniting their strength; one supplying the plough, and the others bringing a horse, bullock, or even a milch cow. Wheat is a plant of very modern introduction in Antrim, and very little of it is sown.

The most important crop is flax.

The cattle consist chiefly of milch cows, belonging to small occupiers, of a small stunted breed. Sheep are very little attended to; and the few that are kept are of a very inferior kind. Goats are numerous in the mountainous parts of the county. Pigs also are kept in great numbers.

This county by no means abounds with wood; nor are fruit-trees cultivated in great abundance, or with very much success. Of the apple, however, several new and valuable varieties have lately been introduced, and advantageously cultivated.

Antrim has long been distinguished for its linen manufacture, but lately the manufacture of cotton has, in some measure, supplanted it, especially in the vicinity of Helms.

There is a considerable salmon-fishing on the coast.

CHAP. IV.

Of the Literature and Bibliography of Agriculture.

7108. The first books on agriculture were written by the Greeks before the Christian era, and by the Romans about the commencement of that period. Hesiod is the only writer of the former people exclusively devoted to husbandry: the earliest Roman author is Cato, and the latest, Palladius, in the fourth century A.D. The works of these and the other agricultural writers of antiquity have been already enumerated (18. and 44.), and the most interesting have lately been re-translated (7110. anno 1800).

7109. In the dark ages few books were written excepting on religion. The first author which appeared on the revival of the arts was Crescentius in Italy, in the fifteenth century; and soon after, in the sixteenth, Fitzherbert in England, Etienne and Liebault in France, Heresbach in Germany, and Herrera in Spain. Since these works appeared, many others have been published in every country in Europe, especially in England, France, and Germany. Though our business is chiefly with the works which have appeared in Britain, yet we shall, after enumerating the chief of them, notice also what has been done in other countries—many foreign works, especially of France, Germany, and Italy, being familiar, either in the original or by translations, to the reading agriculturists of this country.

SECT. I. *The Bibliography of British Agriculture.*

7110. A general view of the literature of British agriculture having been already given (781.), we have here only to supply the bibliographical enumeration confirmatory of that view. Of agricultural books very few at the present day are worth reading for their scientific information; they are chiefly to be considered as historical documents of the progress of opinions and practices; and this is the reason we have arranged them in the order of their appearance, instead of classing them according to the subjects treated of. Those who wish to see them so classed will be amply gratified by Watts's *Bibliographia Britannica*. In our list we have omitted many works on subjects belonging to political agriculture, as the corn laws, tithes, poor-rates, &c.; and also most of those on veterinary surgery, horsemanship, bees, hunting, planting, &c., as not strictly belonging to the subject, and as being for the greater part, those on the veterinary art in particular, worse than useless. In short, the improvements in chemistry, animal and vegetable physiology, and the comparatively clear views of political economy which have taken place chiefly since the commencement of the present century, have rendered most books on agriculture, whether political or professional, not published within the last ten years, of very little value, and a number of them more injurious than useful. In our list those authors who have merely written articles published in the transactions of societies, or in public journals or magazines, are seldom introduced, unless they have also written separate works, and translations are in general omitted.

1532. *Fitzherbert, Sir Anthony*, a very learned lawyer, and also known as the father of English husbandry, was born at Norbury, in Derbyshire, and died there in 1538. He was made judge of the Common Pleas in the 15th of Henry VIII., and wrote several books on law.

1. The Book of Husbandry, very profitable and necessary for all persons. Lond. 8vo.

2. Surveying; and Book of Husbandry. Lond. 1547. 8vo.

3. The Reading on the Statute 4 Edward I. De Extentis Manerii. Lond. 1539.

1535. *Benese, Sir Richard*, Canon of Martin Abbey, near London.

The Manner of Measuring all Manner of Land.

1557. *Tusser, Thomas*, styled the British Varro, was born near Witham, in Essex, 1515; received a liberal education at Eton School, and at Trinity Hall, Cambridge; lived many years as a farmer in Suffolk, and afterwards removed to London, and published his experience in agriculture and gardening. He died in 1580.

1. Five Hundred Points of good Husbandry. Lond. 4to.

2. Another edition entitled Five Hundred Points of Good Husbandry, suited to as many of Good Huswifery; with divers approved lessons concerning Hops and Gardening. Lond. 1575.

1581. *Mascall, Leonard*, author of a work on sowing, planting, and grafting trees, &c. 1572.

1. The Husbandry Ordering and Government of Poultry, &c. Lond. 8vo.

2. The First Book of Cattel, &c. Lond. 1596. 4to.

3. A Booke of Fishing with Hooke and Line, and all other instruments thereunto belonging: another of Sundrie Engines and Trappes to take Poicats, Buzzards, Rats, Mice, and all other kindes of Vermin and Beastes whatsoever; moste profitable for all Warriours, and such as delight in this kinde of sporte and pastime. Lond. 1600. 4to.

1593. *Markham, Gervase, Jarvis, or Gervas.* AD

author, who wrote on a great variety of subjects during the reigns of James I. and Charles I., and died about 1685. He appears, says Harte, (*Essays*, ii. 32.) to be the first Englishman who deserves to be called a hackney writer.

1. The English Husbandman; 2 Parts. Lond. 1613. 4to.

2. The Country Farmer. Lond. 1616. 6d.

3. Farewell to Husbandry. Lond. 1620. 4to.

4. Cheap and Good Husbandry, for the well ordering of all Beasts and Fowls, &c. Lond. 1631. 4to.

5. Enrichment of the World of Kent, &c. Lond. 1631. 4to.

1609. *Butler, Charles*, Vicar of Wotton, in Hampshire, an ingenious writer on various subjects, was born 1559; died 1647.

Feminine Monarchy; or, The History of Bees, and the due ordering of them. Oxon. 8vo.

1626. *Speed, Adam*.

1. Adam out of Eden; or, An Abstract of divers excellent Experiments, touching the Advancement of Agriculture. Lond. 12mo.

2. Husbandman, Farmer, and Grazier's Complete Instructor. Lond. 1697. 12mo.

1635. *Calthorpe, Charles*.

The Relation between a Lord of a Manor and the Copyholder, his Tenant. Lond. 4to.

1638. *Plattes, Gabriel*, author of some tracts on Gardening; a poor man but a useful writer. Harte says, he had a bold adventurous cast of mind, and preferred the faulty sublime to faulty mediocrity. As great a genius as he was, he was allowed to drop down dead in London streets with hunger; nor had he a shirt upon his back when he died. He bequeathed his papers to Hartlib, who seems to have published but few of them.

1. Treatise of Husbandry. Lond. 4to.

2. Discourse of Infinite Treasure, hidden since the World's beginning, in the Way of Husbandry.

3. *Discoveries of Subterranean Treasures*, viz. all manner of Mines and Minerals from the Gold to the Coal, &c. with directions for the finding them. Lond. 1630. 4to.

4. *Recreatio Agricola*. Lond. 1640. 4to.

5. *Observations and Improvements in Husbandry*, with Twenty Experiments. Lond. 1653. 4to.

1642. *Verwarden*, Sir C. a native of Holland, and a colonel in Cromwell's army.

Discourse teaching the Dyeing of the great Fumes lying within the several Counties of Lincoln, Northampton, Huntingdon, Norfolk, Suffolk, Cambridge, and the Isle of Ely. 4to.

1645. *Hartlib, Samuel*, an ingenious writer on agriculture, and author of several theological tracts. He was the son of a Polish merchant, and came to England, according to Weston, about 1640; but the time when he died is unknown. He was a great promoter of husbandry during the times of the commonwealth, and was much esteemed by all ingenious men in those days. Milton addressed to him his treatise on education, and Sir William Petty inscribed two letters to him on the same subject. Cromwell allowed him a pension of a hundred pounds a year.

1. Discourse of Husbandry used in Brabant and Flanders, shewing wonderful Improvements of Land there. Lond. 4to.

2. *Legacy*; or, an Enlargement on the Discourse of Husbandry used in Brabant and Flanders. With an Appendix. 1651. 4to. Lond.

3. Appendix to the *Legacy*, relating more particularly to the Husbandry and Natural History of Ireland. Lond. 1651. 4to.

4. Essay on the Advancement of Husbandry and Learning, with propositions for erecting a College of Husbandry. Lond. 1651. 4to.

5. *The Reformed Husbandman*; or, a brief Treatise of the Errors, Defects, and Inconvenience of our English Husbandry, in ploughing and sowing for Corn; with the Reasons and general Remedies, and a large yet faithful Offer or Undertaking for the Benefit of them that will joy in this good and public Work. Lond. 1651. 4to.

6. *Design for Plenty*, by a Universal Planting of Trees; tendered by some well-wishers to the Public. Lond. 1652. 4to.

7. *Discovery for Division or Setting out of Waste Land in England and Ireland*. Lond. 1653. 4to.

8. *The Complete Husbandman*; or, a Discourse of Husbandry, both Foreign and Domestic. And a particular Discourse of the Natural History of Husbandry in Ireland. Lond. 1659. 4to.

1649. *Bith, Walter*, an officer in Cromwell's army, who, with other English gentlemen holding commissions at that time, was eminently useful in introducing improvements into Ireland and Scotland.

1. *The English Improver*, discovering that some Land, both Arable and Pasture, may be advanced Double and Treble, and some Five and Ten-fold. Lond. 4to.

2. *The English Improver improved*, or the Survey of Husbandry surveyed. Lond. 1654. 4to.

1661. *Evelyn, John*, F.R.S. An eminent philosopher and patriot, particularly skilled in natural history and the fine arts, was born at Wotton, his father's seat, in 1600; and died, and was interred there, in 1705-6.

1. *Eviva*; or, Discourse of Forest Trees. Lond. 1664. fol. Dr. Hunter, of York, published an edition with copious notes and numerous engravings.

2. *Terra*; a Philosophical Discourse of Earth, relating to the Culture and Improvement of it for Vegetation, and the Propagation of Plants, as it was presented to the Royal Society, April 29, 1673. Lond. 1675. 8vo.

3. *Pomona*; a Discourse concerning Cider. Lond. 1679. fol.

4. *A Spanish Drill Plough*. (*Phil. Trans. Abr. l. 457.*) 1670.

1663. *Stranghopes, Samuel*.

Book of Knowledge, in Three Parts; concerning Astrology, Physics, and Husbandry. Lond. 8vo.

1665. *Dodson, Colonel William*. The Design for the perfect Draining of the great Level of the Fen, called Bedford Level, with Maps, &c. Lond. 4to.

1667. *Cavendish, William*, Marquis and Duke of Newcastle.

A New Method and extraordinary Invention to dress Horses, and work them according to Nature; as also to perfect Nature by the subtilty of Art. Lond. 8vo.

1669. *Worlidge, John*, gentleman, author of some works on gardening.

1. *Systema Agricultura*, &c. Lond. fol.

2. *Treatise of Husbandry*. Lond. 1675. fol.

1670. *Smith, or Smyth, John*, commonly called Captain John Smith, Governor of the English Plantations, was born at Willoughby, in the county of Lincoln; died 1631.

England's Improvement revived, plainly discovering the several ways of improving the several Sorts of waste and barren Grounds, and of enriching all Earths, with the natural Quality of all Lands, and the several Seeds and Plants which naturally thrive therein observed, together with the Manner of planting all Sorts of Timber Trees, and Underwoods, experienced in 30 Years' Practice; in 6 Books. Lond. 4to.

1670. *Reeve, Gabriel*. Directions to his Son for the Improvement of Barren and Heathy Land in England and Wales. Lond. 4to.

1673. *Kirby, Christopher*. Strange Effect of Thunder and Lightning on Wheat and Rye in the Granaries of Denstie. (*Phil. Trans. Abr. l. 89.*)

1674. *Cose, Daniel*, M.D. Improvement of Cornwall by Sea sand. (*Phil. Trans. Abr. l. 306.*)

1679. *Beal, Dr. John*, an ingenious English divine and philosopher, was born in Herefordshire, 1603; died 1683.

Agric. Observations and Advertisements. N. 374 and 384. 1678. *Howard, Hon. Charles*, of Norfolk.

On the Culture of Planting and Ordering of Saffron. (*Phil. Trans. Abr. l. 423.*)

1681. *Langford, T.* author of some tracts on fruit trees.

Systema Agricultura; being the Mystery of Husbandry discovered. Lond. fol.

1681. *Houghton, John*, F.R.S.

1. A Collection of *Letters for the Improvement of Husbandry and Trade*. Lond. 4to.

2. Collections for the Improvement of Husbandry, relating to Corn.

3. A Catalogue of all Sorts of Earths; the Art of Draining, or Braving, the Instruments of Husbandry: revised by R. Bradley. Lond. 1727-8. 4 vols. 8vo.

1683. *Lister, Martin*, M.D. an eminent physician and natural philosopher, was born in Buckinghamshire about 1638, practised in London; died 1711-12. He wrote various works.

1. On the Salt Springs of Worcestershire, Staffordshire, and Cheshire, with speculations respecting Salt, &c. (*Phil. Trans. Abr. l. 10.*)

2. Of Plants which may be usefully cultivated for grass or hay. 1696. (*N. Abr. l. 136.*)

1694. *Beaumont, John*. On a new way of Clearing Rocks. (*Phil. Trans. Abr. l. 113.*)

1695. *Moore, Sir Jonas*, Knight, F.R.S., a very respectable mathematician and surveyor general of his Majesty's ordnance, was born in Lancashire, 1617; died 1679.

1. History or Narrative of the great Level of the Fens called Bedford Level; with a large Map of the said Level, as drained, surveyed, and described. 8vo.

2. England's Interest, or the Gentleman and Farmer's Friend. Lond. 1705. 8vo.

1694. *Floyd, Edward*.

1. Account of Locusts in Wales. (*Phil. Trans. Abr. l. 617.*)

2. On the spontaneous Combustion of several Hay Stacks, &c. (*l. p. 618.*)

1697. *Donaldson, James*, a native of Scotland, and one of the earliest and most useful writers on the agriculture of his country.

Enquiry into the present manner of Tilling and Manuring the Ground in Scotland. Edin. 12mo.

1699. *Meager Leonard*, author of *The English Gardener* and other works.

The Mystery of Husbandry. Lond. 12mo.

1707. *Mortimer, John*, author of some tracts on religious education. His works on husbandry were translated into Swedish, and published in Stockholm, in 1727.

The whole Art of Husbandry in the way of Managing and Improving Land. Lond. 8vo.

1717. *Lawrence, Edward*, brother to John Lawrence, a clergyman, author of a work on gardening. (See A. D. 1726.)

On the Duty Owed to his Lord; with an Appendix on Farming. Lond. 1727, 4to.

1718. *Barham, Henry*.

1. Experiments and Observations on the Production of Silk Worms in England. (*Phil. Trans. Abr. l. p. 495.*)

2. An Essay upon the Silk Worm. Lond. 1719. 8vo.

3. Observations on their Productions, and of the Silk in England. 1724. (*Phil. Trans. Abr. l. 445.*)

1718. *Saunder, Stephen*, an eminent gardening author, layer out of gardens, and also a seedsman in Westminster; died 1745. (See *Encyc. of Gard.* page 1102.)

Directions for Burning Clay for Manure. Lond. 8vo. with a plate of the Kiln.

1721. *Bradley, Richard*, F.R.S. and Professor of Botany in the University of Cambridge, a most voluminous writer on gardening, botany, &c.; died 1732. (*Encyc. of Gard. p. 1102.*)

1. Philosophical Treatise of Husbandry and Gardening. Lond. 4to.

2. The Country Gentleman and Farmer's Monthly Director. Lond. 1721. 8vo.

3. Treatise concerning the Manner of Following Ground, raising of Grass, Seeds, and Training of Lint and Hemp. Lond. 1724. 4to.

4. A Survey of Ancient Husbandry and Gardening, collected from the Greeks and Romans; 4 Plates. Lond. 1726. 8vo.

5. General Treatise of Husbandry and Gardening. Lond. 1726. 2 vols. 8vo.

6. Experimental Husbandman and Gardener. Lond. 1726. fol.

7. A Complete Body of Husbandry. Lond. 1727. 8vo.

8. The Weekly Miscellany for the Improvement of Husbandry, Arts, and Sciences. 21 Nos. 1727. 8vo.

9. The Science of Good Husbandry, or the Economy of Xenophon, translated from the Greek. Lond. 1727. 8vo.

10. The Riches of a Hop Garden explained, with the Observations of the most celebrated Hop Planters in Britain. Lond. 1729. 8vo.

1723. *Saunders, William*, M.D. a noted empiric, who lived about the latter end of the 17th and beginning of the 18th century.

Choice Experiments, and Observations on Building, Husbandry, &c. *London*.
 1723. *Molensworth, Robert*, Viscount, ambassador of William III. to the Danish court; born at Dublin, 1756; died 1725.
Considerations for Promoting Agriculture. Dublin.
 1734. *Benson, William*, A.M. of Oxford, a critic of some fame: was born in London 1683; died 1754.
Virgil's Husbandry; with Notes Critical and Rastie. London.
 1736. *Lawrence, John*, M.A. author of *The Clergyman's Recreation*, a gardening work of use in its time; he died in Durham, 1732. (*Encyc. of Gard. p. 1102*).
 The New System of Agriculture, being a complete Body of Husbandry and Gardening in all the parts of them. *London*. fol.
 1739. *Mackintosh, Roland*.
Essay on Ways and Means for Inclosing, Fallowing, Planting, &c. Scotland, and that in sixteen years at farthest. Edinburgh.
 1730. *Richards, John*.
The Gentleman's Steward and Tenant of Manors instructed. London. 8vo.
 1730. *Rye, George*.
Observations on Agriculture. Dublin. 8vo.
 1731. *Tull, Jethro*, was born in Oxfordshire; he was a barrister, and made the tour of Europe; after which he settled on his paternal estate, which he cultivated with so much attention as brought on a disorder in his breast; he then went abroad, and on his return, fixed his residence on a farm in Berkshire, where he renewed his experiments in horse-hoeing husbandry; he died in 1740. His son, John Tull, was an officer in the army, but ruined himself by projects, and died in the Fleet, in 1764. (*Genl. Mag.*)
 1. *Spectamen of a Work on Horse-hoeing Husbandry. London.* 4to.
 2. *New Horse-hoeing Husbandry; or an Essay on the Principles of Tillage and Rotation, wherein is shown a Method of introducing a sort of Vineyard Culture into the Corn Fields in order to increase their Product, and diminish the common Expence by the use of Instruments, described in Cuts, 1733. fol.*
 3. *Supplement to the New Horse-hoeing, &c. London.* 1739.
 1732. *Ellis, William*, a farmer at little Gaddesdon, near Hemstead in Hertfordshire.
 1. *Practical Farmer, or Hertfordshire Husbandman. London.* 8vo.
 2. *Children and Vale Farming explained. London.* 1733. 8vo.
 3. *New Experiments in Husbandry. London.* 1736. 2 vols. 8vo.
 4. *The Timber Tree improved. London.* 1738. 8vo.
 5. *The Modern Husbandman; or, Practice of Farming. London.* 1744. 8vo.
 6. *The Country Housewife's Family Companion. London.* 1750. 8vo.
 7. *The Complete Planter and Cyderist. London.* 1757. 8vo.
 8. *Ellis's Husbandry abridged and methodised. London.* 1772. 2 vols. 8vo.
 1737. *Albin, Eleazar*.
 1. *Natural History of English Song Birds, and other Foreign ones as are esteemed for their singing, with the Cock, Hen, and Egg of each Species. London.* 8vo.
 2. *The History of Excellent Fish. 1794.* 4to.
 1737. *Phillips, Robert*.
Dissertation concerning the present State of the High Roads of England, especially those near London, wherein is proposed, a New Method of repairing and maintaining them. London. 8vo.
 1739. *Trowel, Samuel*.
Treatise of Husbandry and Gardening. London. 8vo.
 1744. *Claridge, John*.
The Shepherd of Banbury's Rules to know of the Change of the Weather. London. 8vo.
 1756. *White, Stephen*, M.A., Rector of Holton, in Suffolk.
Collateral Bee-hives, &c. London. 8vo.
 1757. *Home, Francis*, M.D., Professor of Materia Medica in the University of Edinburgh.
The Principles of Agriculture and Vegetation. London. 8vo.
 1757. *Lisle, Edward*, Esq., late of Crux-Easton, in Hampshire.
Observations on Husbandry. London. 2 vols. 8vo.
 1759. *Stillingfleet, Benjamin*, grandson to the bishop of that name, and an ingenious naturalist and miscellaneous writer, was born about 1702, died 1771.
 1. *Miscellaneous Tracts relating to Natural History, Husbandry, and Physic. Translated from the Latin; with notes. London.* 8vo.
 2. *Calendar of Flora, Swedish and English, made in the year 1755. London.* 8vo. 1761.
 1759. *Mills, John*, F.R.S., author and translator of several works, and among others of Gyllenborg's *Natural and Chemical Elements of Agriculture*, an ingenious work for its time and country.
 1. *A Practical Treatise of Husbandry. London.* 4to.
 2. *A New and Complete System of Practical Husbandry. London.* 1763-5, 6 vols. 8vo.
 3. *An Essay on the Management of Bees. London.* 1766. 8vo.
 4. *An Essay on the Weather; with Remarks on the Shepherd of Banbury's Rules for Judging of its Changes, and Directions for Preserving Hives and Buildings from the fatal effects of Lightning. London.* 1770. 8vo.
 5. *A Treatise on Cattle, &c. London.* 1776. 8vo.

1760. *Hitt, Thomas*, gardener to Lord Manners, at Bloxholme in Lincolnshire, and author of a meritorious work on fruit trees.
A Treatise of Husbandry; or the Improvement of Dry and Barren Lands. London. 8vo.
 1760. *North, Richard*, nursery gardener, near Westminster Bridge Road, Lambeth. (*Encyc. of Gard.* 1805.)
An Account of the different kinds of Grasses propagated in England, for the Improvement of Corn and Pasture Lands. London. 8vo.
 1761. *Roque, Bartholomew*, market gardener at Walham Green, London. By advertisements and other means, he brought the burnt into undeserved repute. He sowed different sorts of grasses, and when they had formed a turf, he sold them as specimens by the square inch. (*Encyc. of Gard.* 1104.)
 1. *A Practical Treatise on Cultivating Lucerne Grass. London.* 4to.
 2. *Some Hints relative to Barnes and Timothy Grass. London.* 1764. 8vo.
 1761. *Wark, Dr. David*, Minister of Haddington.
On the Use of Fences in Fencing the Banks of Rivers. Phil. Trans. xi. 514.
 1761. *Mordant, John*.
The Complete Steward; or the Duty of a Steward to his Lord. London. 2 vols. 8vo.
 1762. *Dickson, Adam*, A.M., minister of Dumee in Scotland. Considered a good classical scholar, and an excellent practical farmer. He died before *The Husbandry of the Ancients* was prepared for the press, which is the occasion of some defects in that work.
 1. *Treatise on Agriculture. Edinburgh.* 8vo. This is one of the best works on tillage that ever has appeared.
 2. *The Husbandry of the Ancients. Edinburgh.* 1778. 2 vols. 8vo.
 1764. *Ladner, of Kroy*, in Yorkshire.
The Farmer's New Guide. London. 8vo.
 1764. *Randall, J.*, some time master of the Academy at Heath, near Wakefield, Yorkshire.
 1. *The Semi-Virgilian Husbandry, deduced from various experiments. London.* 8vo.
 2. *A Construction and extensive Use of a new invented Seed Furrow Plough, suited to all Soils; of a Draining Plough, and of a Potatoes Drill Machine; with the Theory of a Common Plough; illustrated with 7 plates. London.* 1764. 4to.
 1765. *Fordyce, George*, M.D., F.R.S., a distinguished physician, and teacher of medicine in London, was born at Aberdeen, 1736; died 1802.
Elements of Agriculture and Vegetation. Edinburgh. 8vo.
 1768. *Morgan, John*, M.D., F.R.S.; died at Philadelphia, 1789.
Essay on the Expressing of Oil from Sun Flower Seed, &c. (Trans. Amer. Soc.) 1. 303.
 1766. *Homer, Henry*, an excellent classical scholar, was born in Warwickshire, 1752; died 1791.
 1. *An Essay on the Nature and Method of ascertaining the specific Shares of Proprietors upon the Inclosure of Common Fields. London.* 8vo.
 2. *An Inquiry into the Means of Preserving and Improving the Public Roads of this Kingdom. Oxford.* 1767. 8vo.
 1767. *Young, Arthur*, F.R.S., an eminent agriculturist, Secretary to the Board of Agriculture, was the son of Arthur Young, a prebend of Canterbury, and author of *An Historical Dissertation of Corruptions in Religion*. He was born in 1741. He served his apprenticeship to a wine merchant; but on entering into the possession of his paternal estate, near Bury St. Edmunds, he became a farmer; and impoverished himself by experiments. After this he set up as a teacher of others; and in 1770, published a volume called *The Farmer's Calendar*; which was followed by a periodical work, entitled *The Annals of Agriculture*, in which he had the honor of having his late Majesty for a correspondent. Young also made excursions through the British islands, and on the continent, to collect information on subjects of rural economy. At length a Board of Agriculture was established, of which he was appointed secretary, with a salary of six hundred a year. He became blind some years before his death, which happened February 30, 1820. His works are numerous, and his travels amusing. (*Annual Biography*.)
 1. *The Farmer's Letters to the People of England, &c. London.* 8vo.
 2. *The Farmer's Letters to the Landlords of Great Britain. London.* 1771. 8vo.
 3. *A Six Weeks' Tour through the the Southern Counties of England and Wales. London.* 1768. 8vo.
 4. *Treatise on the Management of Hops. London.* 1769. 8vo.
 5. *A Six Months' Tour through the North of England. London.* 1770. 4 vols. 8vo.
 6. *The Farmer's Guide in Hiring and Stocking Farms, &c. London.* 1770. 2 vols. 8vo.
 7. *Rural Economy; or Essays on the Practical Part of Husbandry. London.* 1770. 8vo.
 8. *A Course of Experimental Agriculture. London.* 1770. 2 vols. 4to.
 9. *The Farmer's Tour through the East of England. London.* 1770. 4 vols. 8vo.

10. *Observations on the Present State of the Waste Lands in Great Britain.* Lond. 1778. 8vo.
11. *Tour in Ireland; with General Observations on the Present State of that Kingdom, made in 1776-7-8 and 9.* Dub. 1780. 2 vols. 8vo.
12. *An Essay on the Culture of Cole-seed for feeding Sheep and Cattle.* 8vo.
13. *Annals of Agriculture, and other useful Arts.* Published in Nos. Bury St. Edmunds, 1790, 40 vols. 8vo.
14. *Travels during the years 1787-8 and 9, undertaken more particularly with a View of ascertaining the Cultivation, Wealth, Resources, and National Prosperity of the Kingdom of France.* Bury St. Edmunds, 1792. 4to. 3 vols.
15. *General View of the Agriculture of the County of Suffolk; drawn up for the Board of Agriculture.* Lond. 1797. 8vo.
16. *General View of the Agriculture of the County of Lincoln; drawn up for the Board of Agriculture.* Lond. 1799. 8vo.
17. *An Enquiry into the Propriety of applying Wastes to the Maintenance and Support of the Poor.* Lond. 1801. 8vo.
18. *The Farmer's Kalender, containing the Business necessary to be performed on the various kinds of Farms during every month of the year.* Lond. 1800. 4 vols. 8vo.
19. *Essay on Manure.* Lond. 1804. 8vo.
20. *General View of the Agriculture of Hertfordshire; drawn up for the Board of Agriculture.* Lond. 1804. 8vo.
21. *General View of the Agriculture of the County of Norfolk.* Lond. 1804. 8vo.
22. *General View of the Agriculture of the County of Essex.* Lond. 1806. 2 vols. 8vo.
23. *General Report on Inclosures.* Lond. 1807. 8vo.
24. *General View of the Agriculture of Oxfordshire.* Lond. 1808. 8vo.
25. *A General View of the Agriculture of the County of Sussex; drawn up for the Board of Agriculture.* Lond. 1808. 8vo.
26. *Advantages which have resulted from the Establishment of the Board of Agriculture.* Lond. 1809. 8vo.
27. *On the Husbandry of those celebrated British Farmers Bakewell, Arbutnot, and Duckett.* Lond. 1811. 8vo.
1768. *Hudson, Thomas.*
Treatise on the Management of Bees. Lond. 4to.
1768. *Wall, Richard.*
A Dissertation on Breeding Horses, upon Philosophical and Experimental Principles; being an attempt to promote thereby the Breed of Racers and Horses in general; with some observations on Foreign Horses. Lond. 8vo.
1768. *Dossie, Robert, Esq.*
Memors of Agriculture, &c. Lond. 3 vols. 8vo.
1769. *Weston, Richard, Esq.,* an amateur cultivator in the country, and afterwards a tract writer in London; died about the beginning of the present century.
1. *Tracts on Practical Agriculture and Gardening.* Lond. 8vo.
2. *Tracts on Alabaster, or Gypsum, describing its powerful effects as a very cheap manure, &c.* Lond. 1791. 8vo.
1770. *Peters, Matthew.*
1. *The National Farmer.* Lond. 8vo.
2. *Winter Riches.* Lond. 1771. 8vo.
1770. *Comber, Thomas, L.L.D.,* Rector of Buckworth and Morborne, in Huntingdonshire, died 1778.
1. *Free and candid Correspondence on the Farmer's Letters to the People of England, &c., with the Author and Arthur Young, Esq.* Lond. 8vo.
2. *Rural Improvement in Agriculture, on the principles of A. Young, Esq. To which is added, a Letter to Dr. Hunter of York, on the Rickets in Sheep.* Lond. 1772. 8vo.
1770. *Hunter, Alexander, M.D., F.R.S.L. and E.* was born at Edinburgh, 1733; settled as a physician at Gainsborough, at Beverley, and finally at York, where he died, 1809.
1. *Georgical Essays; in which the Food of Plants is particularly considered.* Lond. 4 vols. 8vo.
2. *Outlines of Agriculture.* York, 1785. 8vo.
3. *A New Method of raising Wheat for a series of years on the same land.* York, 1796. 4to.
1771. *Baker, John Wynn.*
Experiments in Agriculture, made under the Direction of the Dublin Society, in 1769 and 1770. Dub. 8vo.
1774. *Bingsted, Josiah, Esq.*
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2. *General View of the Agriculture of the County of Norfolk; drawn up for the Board of Agriculture and Internal Improvement.* Norwich, 1796. 8vo.
3. *Account of the Improvements made on the Farm in the Great Park of His Majesty the King, at Windsor.* (*Nicholson's Journal*, lii. 423.) 1799.
1775. *Harrison, Gustavus, Esq.*
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cultural writer, was born at Hermiston, a village near Edinburgh, in 1730, on a farm which his parents had possessed for some generations, and which he was intended to inherit and to cultivate. He lost his parents at an early age, but his education was not neglected; he studied chemistry under Dr. Cullen, and soon leaving his farm near Edinburgh, took one in Aberdeenshire of 1300 acres, which, after improving and cultivating for twenty years, he let, and enjoyed an annuity from it during his life. He settled after leaving Aberdeenshire, in the neighborhood of Edinburgh, where he published the *Bee*, in weekly sixpenny numbers, till it extended to 18 volumes. In 1797, he removed to Isleworth, near London, where he published *Recreations in Agriculture*, in six volumes, and his *Description of a Patent Hothouse*. Here he enjoyed his garden, and died of a decline in 1808, aged 69. Besides the works which bear his name, he wrote the reviews of books on rural matters for the *Monthly Review* for many years.

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2. *Miscellaneous Thoughts on Planting and Training Timber Trees, by Agricola.* Edin. 1777. 8vo.
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4. *A Practical Treatise on Peat Moss, considered as in its Natural State fitted for affording Fuel, or as susceptible of being converted into Mould, capable of yielding abundant Crops of useful Produce, with full Directions for converting and cultivating it as a Soil.* Edin. 1794. 8vo.
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7. *Recreations in Agriculture, Natural History, &c. &c.* Lond. 1799. 6 vols. 8vo.
1776. *Home, Henry,* usually called Lord Kaimes, an eminent Scotch lawyer, philosopher, and critic, was born at Kaimes, in Berwickshire, 1796; died 1782. He farmed his own estate in Berwickshire many years; he afterwards removed to Blair Drummond, near Stirling, where he made various and extensive improvements, the most important of which was the clearing, cultivating, and peopling great part of Flanders Moss. (See 418.)
1. *The Gentleman Farmer; being an attempt to improve Agriculture, by subjecting it to the test of Rational Principles.* Edin. 8vo.
2. *Observations concerning Shallow Ploughing.* (*Ess. Phys. and Lit.* iii. c. 68.)
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be published; another on *Agriculture*, which he did not live to complete; and a *Rural Institute*, in which he was supplanted by the Board of Agriculture.

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9. *Proposals for a Rural Institute, or College of Agriculture, and other Branches of Rural Economy*. Lond. 1799. 8vo.

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1. Address to the Board of Agriculture on the Subject of Sheep and Wool. Lond. 8vo.

2. The System followed during the Two last Years by the Board of Agriculture, &c. 1800. 4to.

3. Facts and Observations relative to Sheep, Wool, Ploughs, and Oxen, &c. Lond. 1805. 8vo.

1799. *Robertson, James*, D.D. minister at Callendar, Perthshire.

1. General View of the Agriculture of the County of Perth. Perth. 8vo.

2. General View of the Agriculture of Inverness-shire. 8vo.

3. General View of the Agriculture of Kincardineshire. 1811. 8vo.

1800. *Ones, Rev. T.*, M.A. rector of Upton Soudan, Wilts.

1. The Three Books of M. Terentius Varro, concerning Agriculture. Translated into English. Lond. 8vo.

2. Agricultural Parables. Translated from the Greek. Lond. 1806. 2 vols. 8vo.

3. Translation of the Fourteen Books of Palladius on Agriculture. Lond. 1807. 8vo.

1800. *Washington, Gen. George*, first president of the United States of America, and commander in chief of the armies, was born in the county of Virginia, 1732; died 1799.

1. Letters from him to Sir John Sinclair on Agricultural and other interesting Topics; engraved from the original Letters, so as to be an exact Fac-simile of the Handwriting of that celebrated Character. Lond. 4to.

2. Letters to Arthur Young, Esq., containing an Account of his Husbandry, with a Map of his Farm; his Opinions on various Questions in Agriculture, and many Particulars of the Rural Economy of the United States. Lond. 1801.

1800. *Tuke, John*, land surveyor.

General View of the Agriculture of the North Riding of Yorkshire. 3 Plates. Lond. 8vo.

1800. *Thomson, Rev. John*, D.D.

General View of the Agriculture of the County of Fife. Edin. 8vo.

1800. *Stacey, Rev. Henry Peter*, LL.B., F.L.S.

Observations on the Failure of Turnip Crops. Lond. 8vo.

1800. *Parry, Caleb Hillier*, M.D., F.R.S. physician, Bath. He cultivated his own estate, and greatly improved the merino-ryland breed of sheep.

Facts and Observations, tending to shew the Practicability and Advantage to the Individual and the Nation, of producing in the British Isles, Clothing-wool equal to that of Spain; together with some Hints towards the Management of Sax-wooled Sheep. Lond. 8vo.

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Treatise on the Culture of Wheat. Lond. 8vo.

1800. *Darwin, Erasmus*, M.D., F.R.S., an eminent physician, philosopher, and poet, was born near Newark, in Nottinghamshire, 1731; died 1802.

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1800. *Pontey, William*, nurseryman and forest pruner to the Duke of Bedford; originally a kitchen gardener, now a director of plantations, and other improvements.

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2. A Short Account of the Causes of the Diseases in Cows, called by Farmers the Blight, the Milddew, and the Rust. With Plates. Lond. 4to. 1803.

3. An attempt to ascertain the Time when the Peasants

(*Salsola tuberosa*) was first introduced into the United Kingdom, with some Account of the Hill Wheat of India. (Trans. H. Soc. i. 8. 1815.)

1833. *Carpenter, J.* Worcestershire.

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2. Agricultural Magazine; or Farmer's Monthly Journal of Husbandry and Rural Affairs, &c. From July 1807, to December 1808. 3 vols. 8vo. Discontinued.

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1805. *Somerville, Robert*, a surgeon in Haddington, and for some time joint editor with Brown of Markle of *The Farmer's Magazine*; he died in 1808.

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1808. *Bakewell, Robert*, Esq., an eminent geologist and mineralogist, author of *Travels in the Tarentaise, &c.* an instructive and entertaining work, published in 1825.

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1820. *Burroughs, Edward, Esq.*
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post captain in the Royal Navy; a vice-president of the Pastoral Society of Selkirkshire, &c.

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Practical Remarks on the Management and Improvement of Grass Land, as far as relates to Irrigation, Winter-flooding, and Drainage; in a Letter to the Land Owners, &c. of the County of Essex. Lond. 8vo.

1824. Stacey, Robert N. Esq. barrister.

Essay on the beneficial Direction of Rural Expenditure. Lond. 12mo.

SECT. II. Bibliography of Agriculture in Foreign Countries.

7111. Numerous works on agriculture are published in the French and German languages, and a considerable number in the Italian; but a much greater proportion of these are translations from British authors than original works. Very few agricultural books have been printed in the Dutch, Flemish, Danish, Swedish, Polish, Spanish, or Portuguese languages, and scarcely any in those of Russia or Hungary. We shall notice the principal French, German, and Italian works, exclusive of translations, and add a few American books.

SUBSECT. 1. Bibliography of French Agriculture.

7112. Of French books on agriculture we have given a selection only: those who wish to see a complete list are referred to the *Bibliographie Agronomique*, Paris, 8vo.; in which are given the titles of upwards of 2000 works, including translations and books on gardening. A general idea of French culture in all its branches may be obtained from the *Nouveau Cours Complet d'Agriculture*, 16 vols. 8vo., (edition of 1821.) compiled by the members of the Section of Agriculture of the French Institute, each of whose names are given to the articles he contributed.

1529. Etienne, Charles, et J. Liebault, physicians. Etienne, i.e. Stephanus or Stephens, in the beginning of the sixteenth century published various small tracts on Gardening and other rural topics; and in 1529 he collected them together and published them under the title of *Prædium Rusticum*, treating of gardens, trees, vines, fields, meadows, lakes, forests, orchards, &c. Having married his daughter to Liebault, also a physician, they afterwards studied agriculture conjointly, and published the *Maison Rustique*, the modern editions of which are still the most popular agricultural works in France.

1. *Prædium Rusticum*, in fol.

2. *L'Agriculture et Maison Rustique*. Paris, in 4to. 1570.

1569. Heslon Jacques, of Dauphiny.

De l'Art et Science de trouver surement les Eaux, Sources et Fontaines cachées sous Terre, autrement que par les Moyens Vulgaires des Agriculteurs et Architectes, in 4to.

1583. Hegemon, Philibert, a lawyer born at Châlons-sur-saône. Died in 1595.

La Colombe et Maison Rustique, contenant une Description des Douze Mois et des Quatre Saisons de l'année, avec Enseignement de ce que le Laboureur doit faire par chaque Mois. Paris, in 8vo.

1602. Lelietier.

Brief Discours contenant la Manière de nourrir les Vers à Soie, &c. Avec de Belles Figures. Paris, in 12mo.

1604. Lafenas, Barthélemy de, valet de chambre to Louis XIII.

La Façon de faire et semer la Graine de Mûriers, les élever et replanter, gouverner les Vers à Soie au Climat de France. Paris, in 12mo.

1607. Vincet, Elie, a learned professor at Bourdeaux, author of a work on land surveying.

La Maison Champêtre et Agriculture. Paris, in 4to.

1663. Patin, Charles, son of a physician of that name.

Traité des Tourbes Combustibles. Paris, in 4to.

1703. Liger, Louis, born 1658, died in 1717. In the latter part of his life he seems to have been a book-seller, or an author by profession.

1. Dictionnaire Général des Termes propres à l'Agriculture, avec leurs Définitions et Etymologies. Paris, in 12mo.

2. La Nouvelle Maison rustique, ou Economie Générale des Biens de la Campagne. Paris, 2 vols. in 4to. 1755.

3. L'Economie Générale de la Campagne, ou Nouvelle Maison rustique. 1762.

4. Nouveau Système d'Agriculture. 3 vols. in 8vo. 1775.

1749. Boucher, d'Argis, Antoine Gaspard, advocate and author of some works on jurisprudence.

Code Rural, ou Maximes et Règlemens concernant les Biens de la Campagne, 2 vols.

1749. Réaumur, René, Antoine Ferchault, sieur de,

a learned naturalist, born at Rochelle in 1683, died in 1757.

Art et Pratique de l'Art de faire éclore, en toutes Saisons, des Oiseaux Domestiques de toutes espèces. Paris, Imprim. Royale, 3 vols. in 12mo. avec fig.

1750. Hamel, Du Monceau, Henry Lewis du, a famous French writer on Rural Economy and Vegetable Physiology, was born at Paris, 1700; died there 1783.

1. Traité de la Culture des Terres. Par. 6 vols. 12mo.

2. Elémens d'Agriculture. Par. 1764. 2 vols. 12mo.

3. Traité de la Conservation des Grains, et en Particulier du Froment. Par. 1754. 12mo.

4. Traité des Arbres et Arbustes, qui se cultivent en France, en pleine terre. Par. 1755. 2 vols. 4to.

5. Traité complet des Bois et des Forêts. Par. 1758. 6 torn. 4to.

6. Des Semis et Plantations des Arbres, et de leur Culture. Par. 1750. 4to.

7. Histoire d'un Insecte qui devore les Grains de l'Aragou-mois. Par. 1762. 12mo.

8. De l'Exploitation des Bois, ou Moyen de tirer parti des Taillis demi Futayes et hautes Futayes. Par. 1764. 2 vols. 4to.

9. Mémoire sur la Garence et sa Culture, in 4to. 1765.

10. Du Transport, de la Conservation, et de la Force du Bois 1767. 4to.

1751. Desbois, Francis Alexander Aubert de la Chesnaie, a laborious Dictionary-maker; was born at Ernée in the Maine, 1699; died 1784.

Dictionnaire d'Agriculture. 2 vols. 8vo.

1755. Blauet, librarian to the Prince of Conti.

Essai sur l'Agriculture Moderne. Paris, in 12mo.

1755. Tillet, du, of Bourdeaux, a zealous agriculturist, author of several works. He died in 1791.

Dissertation sur la Cause qui corrompt et noircit les Grains de Blé dans les épis, in 4to.

1756. Hasfer, F. W.

Instruction sur la Manière d'élever et de Perfectionner les Bêtes à Laine. Paris, 2 vols. in 12mo.

1760. Alletz, Pons Augustin, an advocate, and indefatigable compiler.

L'Agronomie, ou Dictionnaire portatif du Cultivateur. 2 vols. in 8vo.

1760. Buch'ox, Pierre Joseph, a physician, and member of several societies; born at Metz in 1731, died in great distress at Paris in 1807. He wrote above three hundred volumes relative to medicine, agriculture, the veterinary art, and natural history.

A plant (Buchoziana) was named after him by L'Heretier.

1. Lettre sur la Méthode de s'enrichir promptement et de conserver sa Santé par la Culture des Végétaux, in 8vo.

2. Lettre sur le Blé de Smyrne, in 8vo. 1768.

3. Histoire des Insectes nuisibles à l'Homme, aux Bestiaux, &c. in 12mo. 1781.

4. *Manuel usuel et économique des Plantes*, contenant leur Propriétés pour les Usages économiques. Paris, in 12mo. 1782.

5. *Histoire des Insectes utiles à l'Homme, aux Animaux et aux Arts*. Paris, in 12mo. 1785.

6. *Traité de la Pêche, ou l'Art de soumettre les Poissons à l'Empire des Hommes*, Précédé de l'Histoire Naturelle de ces Animaux, in 12mo. 1786.

7. *Dissertation sur la Betterave et la Poiree*, leur Culture, Méthode pour en tirer du Sucre, &c. fol. 1787.

8. *Dissertation sur le Cochon*, in fol. 1789.

9. *Dissertation sur le Lin de Sibirie*, in fol. 1789.

10. *Dissertation sur la Tauxe*; les Moyens de la prendre, in fol. 1790.

11. *Dissertation sur le Tirage de la Soie*, in fol. 1792.

12. *Manuel Tabacal et Sternutatoire des plantes*, ou *Traité des Plantes qui sont propres à faire éternuer*, avec la Manière de cultiver le Tabac, de le préparer, et de juger de ses bons Effets dans la Société, in 8vo. 1799.

13. *Manuel Territorial des Plantes*, in 8vo. 1799.

14. *Manuel Vétérinaire des Plantes*, in 8vo. 1799.

15. *Mémoire sur le Blé de Smyrne*, sur le Blé de Turquie, le Millet d'Afrique, et la Potherbe d'Abyssinie, Plantes Alimentaires pour l'Homme; in 8vo. 1824.

16. *Mémoire sur la Manière de former des Prairies Naturelles*, in 8vo. 1805.

1760. *Turbilly, Louis-François-Henri de Menon*, Marquis de, a proprietor in Anjou, who had been in the army, but who retired to his estates and broke up and improved a number of acres, of which he published an account, well known at that time in England. Arthur Young, when in France in 1787, was anxious to visit the Marquis; but after, with difficulty, finding out the estate of Turbilly, he found the Marquis had died in 1776, having ruined himself by establishing a pottery. There is a very interesting account of this visit in *Young's Tour*, part I. p. 294, et seq.

1. *Mémoire sur les Défrichemens*. in 12mo.

2. *Pratique des Défrichemens*. Paris, in 12mo. 1701.

1761. *Guillot, Julien-Jean-Jacques*.

Discours sur les Branches d'Agriculture les plus avantageuses à la Province de Normandie.

1761. *Neuve-Eglise, Louis-Joseph Bellepierre de*, An officer in the army.

1. *L'Agronomie, ou Corps complet des Principes de l'Agriculture*, &c. 8 vols. in 8vo.

2. *Boussole Agronomique, ou le Guide des Laboureurs*, in 8vo. 1762.

1762. *Desplaces, Laurent-Benoist*.

1. *Preservatif contre l'Agronomie, ou l'Agriculture réduite à ses vrais Principes*. Paris, in 12mo.

2. *Histoire de l'Agriculture ancienne*, extrait de l'Histoire Naturelle de Plin, avec des Eclaircissements et des Remarques. 12mo. 1765.

1762. *Despoisiers*.

L'Art de fertiliser promptement par l'Agriculture. Paris, 12mo.

1762. *Lafaille, Clement*, advocate, and member of several societies.

1. *Mémoire sur les Moyens de multiplier aisément les Familles dans le Pays d'Aunis*.

2. *Essai sur l'Histoire naturelle de la Tauxe*; sur les différents Moyens qu'on peut employer pour la détruire. La Rochelle, in 12mo. fig. 1768.

1762. *L'Eclat-de-la-Salle, Simon-Philibert de*, of Rheims, a lawyer.

Des Prairies artificielles, ou Moyens de perfectionner l'Agriculture dans toutes les Provinces de France, surtout en culture dans toutes les Provinces de l'Engrais Champagne, par l'entretien et le renouvellement de l'Engrais avec un *Traité sur la Culture de la Luzerne*, du Trèfle, et du Sainfoin, et une *Dissertation sur l'Exportation du Blé*. Paris, 8vo.

1763. *Barthez de Marmorieres*, an officer, secretary of embassy, and member of various societies.

Mémoires d'Agriculture, &c. 8vo.

1763. *Duvergé*, a physician of Tours.

Analyse chimique des Terres de la Province de Touraine, des différents Engrais propres à les améliorer, et des Semences convenables à chaque espèce de Terre. Tours, 8vo.

1763. *François, Nicholas*, de Neufchâteau, member of the Institute, the Senate, &c., a distinguished member of the Paris Agricultural Society, and author of numerous papers in their memoirs.

1. *Avis aux Cultivateurs et Propriétaires de Troupeaux*, sur l'Amélioration des Laines. Paris, 8vo. an vii.

2. *Essai sur les Moyens de tirer le parti le plus avantageux de l'Exploitation d'un Domaine borné, ou Système d'Agriculture pour les petits Propriétaires*. Neufchâteau, 8vo. 1790.

3. *Essai sur la nécessité et les Moyens de faire entrer dans l'Instruction publique l'Enseignement de l'Agriculture*; lu à la Société d'Agriculture de la Seine, &c. 8vo. 1802.

4. *Rapport sur le Perfectionnement des Charrues*, fait à la Société Libre d'Agriculture du Département de la Seine. Paris, 8vo.

5. *Repertoire universel et raisonné d'Agriculture*. Paris, 12mo. 1804.

1763. *Préfontaine*.

Maison Rustique à l'Usage des Habitans de la partie de la France équinoxiale, connue sous le Nom de Cayenne. 8vo.

1763. *Thierat*. An officer of the royal forests, author of some tracts on gardening.

Instructions familières en forme d'Entretien sur les principaux Objets qui concernent la Culture des Terres. Paris, 12mo.

1764. *Bertrand, Elie*, a clergyman at Orb, in Switzerland, and member of various societies.

1. *Traité de l'Irrigation des prés*. 12mo.

2. *Elémens d'Agriculture*, fondés sur les Faits et les raisonnemens, à l'Usage du Peuple de la Campagne. 8vo. 1774.

1764. *Bertrand, Jean*, brother of Elie B.

De l'Eau relativement à l'Economie Rustique, ou *Traité de l'Irrigation des prés*. Lyons, 12mo.

1764. *Dupont*, of Vernois, formerly a member of the constituent assembly.

1. *Lettre sur la Différence qui se trouve entre la Grande et la Petite Culture*. Soissons, 8vo.

2. *Journal d'Agriculture*, &c. 8vo. 1766.

1765. *Chambroy, Louis*, Marquis de, an amateur apple grower and cyderist.

L'Art de Cultiver les Pommiers, les Poiriers et de faire les Cidres, selon l'Usage de Normandie. Paris, 12mo.

1765. *Sarcey-de-Sutieres*, an officer in the army, and "gentilhomme servaut" of the king.

1. *Agriculture expérimentale à l'Usage des Agriculteurs, Fermiers, et Laboureurs*. Paris, 12mo.

2. *Cours complet d'Agriculture, ou Leçons périodiques sur cet Art*. 1788.

1768. *Lesbros-de-la-Versane, Louis*, of Marceilles.

Traité de la Girance, ou Recherches sur tout ce qui a Rapport à cette Plante. 8vo.

1768. *Marchand, Jean-Henri*.

Les Défrichemens Champêtres. 2 vols. 12mo.

1768. *Pateau, Guillaume-Louis Formanoir de*, of Sens, author of a work on bees.

Observations et Expériences sur diverses Parties de l'Agriculture. Sens, 8vo.

1769. *Chanvalon*, a clergyman.

Manuel des Champs ou Recueil choisi, instructif et amusant de tout ce qui est le plus utile et le plus agréable pour vivre avec aisance et Agrément à la Campagne. Paris, 12mo.

1769. *De Breze*.

Essai sur le Haras, ou Examen des Moyens propres pour établir, diriger et faire prospérer les Haras; suivi d'une Méthode facile de bien Examiner les Chevaux qui l'ont vout acheter. 8vo. fig.

1769. *Rigaud de l'Isle*, of Crest, in Dauphiny.

Mémoire sur la Culture de l'Esparcette, ou Sainfoin. Paris, 8vo.

1769. *Sieure*.

1. *Mémoire et Journal d'Observations sur les Moyens de garantir les Olives de la piqûre des Insectes*, et nouvelle Méthode pour en extraire l'Huile plus abondante par l'invention d'un Moulin domestique, avec la Manière de la garantir de toute l'Incuriosité. Paris, 12mo.

2. *Mémoires sur divers Constructions en Terre ou Argile, propres à faire jouir les petits Ménages de l'Economie des combustibles*. Poitiers, 8vo. 1804.

1770. *Amiot, Le P.* missionary at Pekin.

Reflexions sur l'Agriculture et sur ceux qui s'y consacrent, tirées de l'Éloge de la Ville de Moukden et de ses Environs: l'Œuvre composé par Kien-Long, Empereur de la Chine et de la Tartarie, actuellement regnant, traduit en Français par P. Amiot, et publié par M. Deguignes, Membre de l'Académie Royale des Inscriptions et Belles Lettres, et Professeur des Langues Orientales au Collège Royal. Paris, 8vo. Cet Ouvrage est curieux sous plus d'un rapport.

1770. *Beaume, Antiohy*, an eminent French chemist, was born at Senlis, 1723; died 1805.

Mémoire sur les Argiles, ou *Recherches sur la Nature de Terres les plus propres à l'Agriculture, et sur les Moyens de fertiliser celles qui sont Steriles*. Paris, 8vo.

1770. *Rien*.

Encyclopédie Economique, ou Système général d'Economie Rustique, contenant les meilleures Pratiques pour fertiliser les Terres, la conservation des Grains, &c. par quelques Membres de la Société d'Agriculture de Berne. Yverdon, 16 vols. 8vo.

1772. *Rozier, François*, born in Lyons, in 1734, and killed there on the 29th September 1793, during the siege of that city, by a bombshell, which buried his shattered remains in the ruins of the apartment which he occupied; he began his career as an author by writing in the *Journal de Physique et d'Histoire Naturelle*, of which Gauthier Dagoz was editor. He next occupied himself with his agricultural or rural dictionary, the work by which he is chiefly known. He cultivated a farm near Beziers, which Arthur Young went to see when on his tour in France in 1787; but the Abbé had left it on account of the Bishop of Beziers, who kept a mistress somewhere near, and for his more commodiously visiting her, got a road made across the farm at the expense of the province. This occasioned a quarrel between the Abbé and the Bishop, which ended in the former being obliged to quit his farm. The Abbé, like all other men who depart from common practices, was looked on as a fanciful and wild cultivator, and because he paved his stables and cow houses, it was reported by his neighbors that he paved his vineyard. He wrote a great many works, chiefly on agriculture.

1. *L'Art du Maçon piseur*, extrait du *Journal d'Observations sur la Physique*. in 12mo.

2. *Traité de la meilleure Manière de cultiver la Navette et le Colza*, et d'en extraire une Huile Dépourvue de son mauvaise Goût et de son Odeur d'agréable. Paris, in 8vo. 1774.

3. *Cours Complet d'Agriculture, Théorique, Pratique, Economique, etc. ou Dictionnaire universel d'Agriculture*. 12 vols. in 4to. 1796.

1773. *Bexon, Gabriel Leopold Charles Ame*, a

miscellaneous writer, was born at Rendremont, 1748; died at Paris 1784: he had a great turn for Natural History, and assisted Buffon in the latter volumes of his great work.

1. *Le Système de la Fertilisation*, 8vo.

2. *Catéchisme d'Agriculture*, ou Bibliothèque des Gens de la Campagne. 1775. 12mo.

1773. *Trocher*.

L'Art de Fertiliser les Terres et de préserver de la Gelée, commodément et à peu de frais, les Arbres et Arbustes, les Vignes, &c. Méthode d'Education nationale et Particulière. Paris. 3 vols. in 8vo.

1774. *Lerouge*, a friar of the order of Cîteaux, in the abbey of Trisay.

Principes de Cultivateur, ou Essai sur la Culture des Champs, &c. avec un Traité abrégé des Maladies des Cultivateurs, de leurs Bestiaux, et des Remèdes pour les Guérir. 2 vols. in 12mo.

1778. *Ruliard*, died at Paris in 1793.

Aviologie Française, ou Traité général de Toutes les Ruses dont on peut se servir, pour prendre les Oiseaux qui sont en France. Paris, in 12mo.

1779. *Ameillon, Hubert Pascal*, a librarian in Paris, and member of the legion of honour.

Journal d'Agriculture, &c. depuis Janvier. 1779: jusqu'en Décembre, 1785. Paris. 15 vols. in 12mo.

1779. *Maupin*, valet de chambre to the queen of Louis XV.

1. L'Art de la Vigne, contenant une nouvelle Méthode économique de Cultiver la Vigne. in 8vo.

2. Avis sur la Vigne, les Vins et les Terres. in 8vo. 1786.

3. *Almanach*, ou Manuel des Vignerons de tous les Pays. Paris. in 8vo. 1789.

1780. *Bouthier*, advocate at Vienne in Dauphiny. Le Citoyen à la Campagne ou Réponse à la Question: quelles sont les Connaissances Nécessaires, à un Propriétaire qui fait valoir son Bien pour vivre à la Campagne d'une Manière utile pour lui et les Paysans qui l'environnent; dans le cas où les Propriétaires ne demeurent point dans leurs Biens, quelles seraient également les Connaissances Nécessaires pour que les Curés, indépendamment de leurs Augustes Fonctions, pussent être utiles à leurs Paroissiens. Genève. in 8vo.

1780. *Copinac, Abbe*. Ornithologie artificielle. Paris. in 12mo. avec fig.

1780. *Mallet, Robert Xavier*, author of various works on gardening and rural subjects.

Précis Élémentaire d'Agriculture, &c. Paris, in 12mo. an lit.

1781. *Parmentier, Antoine Augustin*; born 1737, at Montdidier, in the department of La Somme, one of the most distinguished chemists and careful philosophers which have appeared in France; author of a great number of works, and co-operator in many others, as the *Annales de Chimie, Nouveau Cours d'Agriculture*; he is mayor of Enghien, and has a small garden there, richer stocked with rare plants than any other in Europe of its size. (See *Encyc. of Gard.* p. 1119.)

1. Recherches sur les Végétaux Nourrissans, qui dans les Temps de Disette, peuvent remplacer les Alimens Ordinaires. Paris. in 8vo.

2. Méthode facile pour Conserver à peu de Frais les Grains et les Farines. in 12mo. 1784.

3. Observations sur les Méans de maintenir et de rétablir Salubrité de l'Air dans la Demeure des Animaux Domestiques. an xi.

4. Instruction sur les Moyens de rendre le Blé Moucheté propre à la Semence. Imp. roy. 1785.

5. Mémoire sur la Conservation et l'Usage des Bleds de Turquie. Bordeaux, in 8vo. 1785.

6. Mémoire sur les Semailles. 1790.

7. Mémoire sur la Nature et la Manière des Engrais. 1791.

8. Mémoire sur les Clôtures.

9. Traité sur les Pommes de Terre, in 8vo. 1795.

10. Avis sur la Culture et les Usages des Pommes de Terre in 8vo.

11. Traité du Maïs, in 12mo.

1782. *Berthelot*, engineer to Louis XVI.

La Mécanique appliquée aux Arts, aux Manufactures, à l'Agriculture et à la Guerre. Paris. 2 vols. bound, in 4to. fig.

1782. *Cadet de Vaux, Antoine Aleris*, a distinguished patriot, founder of various useful institutions, and author of many projects for the public advantage, which have been carried into effect with success; author of and co-operator in many economical publications.

1. Avis sur les Bleds germés, in 8vo.

2. Bibliothèque des Mémoires ruraux, Journal d'Economie Rurale et Domestique; par une Société de Savans et de Propriétaires.

1782. *Parmentier, Deyeux*, and others. See 1781.

Bibliothèque Physico-Economique, instructive et amusante, des Villes et des Campagnes, (Paris. published monthly) 12mo. 68 vols. to 1823.

1784. *Dumont, Courcet*, of Boulogne, where he cultivates his own estate of Courset, and has published a useful gardening work. (*Encyc. of Gard.* p. 121, A.D. 1802.)

Mémoires sur l'Agriculture du Boulonnais, et des Cantons Maritimes voisins. Boulogne, in 8vo.

1715. *Chabert, Philippe*, inspector general of veterinary schools, and member of the legion of honor.

1. Instruction sur la Manière de conduire et gouverner les Vaches Lactières, in 8vo.

2. Alteration du Lait de Vache, désignée sous le Nom de Lait bleu, in 8vo. 1803.

3. *Dune Abstraction du Lait de Vache*, &c. Paris, in 8vo. 1806.

1786. *Servier, B. de*.

Instructions sur la Manière de cueillir les Feuilles des Arbres de la conserver et de les donner à manger aux Bestiaux; Publiée par Ordre du Roi. in 8vo.

1787. *Amoreux*, a physician at Montpellier.

1. Mémoire sur les Haies destinées à la Clôture des Prés, des Champs, des Vignes et des Jeunes bois. Paris, in 8vo.

2. Mémoire sur la Nécessité et les Moyens d'Améliorer l'Agriculture dans le district de Montpellier, Avignon, &c. in 8vo.

1787. *Brousseau, Pierre-Marie Auguste*, member of the legislative assembly, of the commission of monuments, and author of a number of papers in the Memoirs of the Paris agricultural society.

1. Année rurale, ou Calendrier à l'Usage des Cultivateurs. Paris. 2 vols. in 12mo.

2. Feuille du Cultivateur. 8 vols. in 4to. 1788.

1789. *Cligot, Bleruache*, of Reims, inspector of manufactures and commerce.

L'Ami du Cultivateur, ou Essai sur les Moyens d'Améliorer en France la Condition des Laborateurs, des Journaliers, des Hommes de peine, vivant dans les Campagnes, et celle de leurs Femmes et de leurs Enfants. Paris. 2 vols. in 8vo.

1789. *Varenne, de Fenille, P. C.*, born at Bresse, and condemned to die by the revolutionary tribunal at Lyons in 1794, a zealous agriculturist, and much respected.

1. Observations, Expériences, et Mémoires sur l'Agriculture et sur les Causes de la Mortalité du Poisson dans les Etangs. Lyons, in 8vo. fig.

2. Observations sur les Etangs, in 8vo. 1798.

3. Oeuvre d'Agriculture de Varenne Fenille, troisième et dernière Partie. Mémoires et Expériences sur l'Agriculture, et particulièrement sur la Culture et l'Amélioration des Terres le Désaichement et la Culture des Etangs et des Marais, la Culture et l'Usage du Marais, &c. in 8vo. 1808.

1790. *Cotté, L.* a priest of the oratory author of some meteorological tracts.

1. Leçons élémentaires d'Agriculture, par Demandes et par Réponses, à l'Usage des Enfans, avec une Suite de Questions sur l'Agriculture. in 12mo.

2. Catéchisme à l'Usage des Habitans de la Campagne, sur les Dangers auxquels leur Santé et leur Vie sont Exposés, &c. in 12mo. 1799.

1790. *Dubois, J. B.*, author of an interesting memoir on the hay forks made of the forked branches of the nettle tree in common use in the south of France.

Feuille d'Agriculture, d'Economie Rurale et Domestique, à l'Usage des Propriétaires, &c. in 4to.

1790. *Mayet, Etienne*.

Mémoire sur les Moyens de mettre en Culture, la plus Avantageuse les Terrains secs et arides, principalement ceux de la Champagne. in 8vo.

1791. *Abeille, F. of Toulon*.

Observations de la Société d'Agriculture, sur la Question suivante, proposée par le comité d'Agriculture et de Commerce de l'Assemblée Nationale; l'Usage des Domaines confisqués est-il utile ou non aux Progrès de l'Agriculture, in 8vo.

1791. *Lamoignon Maleherbes, Chretien Guillaume*, a statesman, born at Paris, 1721, guillotined 1794; he was esteemed a patriot, a man of correct morals and elegant taste.

Idees d'un Agriculteur Patriote sur le Défrichement des Terres incultes, sèches et maigres, connues sous le Nom de Landes, Garrigues, Gâtines, Fiches, &c. in 8vo.

1791. *Paillet*.

Instructions sur la Plantation, la Culture et la Récolte du Houblon. in 8vo.

1791. *Trassier, Henri Alexandre*, professor of agriculture and commerce in the central schools; he has paid great attention to the Merino breed of sheep, and the Angora variety of goat, of which government has put a large flock under his care.

1. Avis aux Cultivateurs, sur la Culture du Tabac en France, Publiée par le Ministère Royale d'Agriculture. Paris, in 8vo.

2. Journal d'Agriculture à l'Usage des Habitans de la Campagne. in 8vo. 1791.

3. *Annales de l'Agriculture Française*, by M. M. Toussier & Box. 12 Numbers annually, or 4 vols. 8vo.

4. Instruction sur les Moyens de détruire les Rats des Champs et les Moutons, Publiée par Ordre du Ministère de l'Intérieur, in 8vo.

5. Mémoire sur l'Importation à France des Chèvres à duvet Cachemere. 8vo. pp. 32. Paris, 1819.

1792. *Cointereaux, Francois*, an architect, but more occupied as an author.

1. Architecture Rurale, &c. Paris, in 8vo.

2. Cours d'Architecture rurale pratique, &c. in 8vo. avec figures, 1792.

3. Les Erreurs de mon Siècle sur l'Agriculture, 1793.

4. *Almanach perpétuel des Cultivateurs*. Paris, in 12mo. 1794.

5. Nouveau Traité d'Economie Rurale, in 8vo. 1803.

6. Des nouvelles Bergeries, de ce qui les constitue bonnes et très salubres, in 8vo. 1805.

7. Des nouvelles Dispositions et Constructions des Faïsses, des Moyens de Multiplier les Faïsses, avec la Manière d'élever les Oiseaux, &c. 1803.

8. Ecole d'Architecture Rurale. Lyon, in 8vo. an iv.

9. La Ferme. in 4to.

10. Nouveau Mur de Terrasses solides et durables, et qui dispensent de la Profondeur de Matériaux qu'on y emploie; Ouvrage utile à tous les Pays; principalement aux Architectes, Ingénieurs, Négocians, et aux Propriétaires, Agens, et Fermiers. in 8vo. 1805.

11. Traité de l'ancien Pisé des Romains, &c. Traité qui

indique les Qualités, des terres propres au Pisé, les Enduits, &c. Traité sur les Manufactures et les Maisons de Campagne. Traité qui enseigne le nouveau Pisé, la Manière de le faire lors des Pluies, des Neiges et des Frimas. 8vo.

1792. *Olivier, G. A.*

Mémoire sur la Cause des Recoltes alternes de l'Olivier; du tort que les Oliviers éprouvent l'Année de la Mauvaise Recolte. Moyens de se procurer des Recoltes annuelles et diminuer le Nombre des Insectes Rongeurs des Oliviers. Paris, in 8vo.

1794. *Belair, A. P. Julienne*, an engineer, formerly in the service of Holland and Prussia: he has written also on military subjects.

Mémoire sur les Moyens de parvenir à la plus grande Perfection de la Culture et de la Suppression des Jachères, in 8vo.

1794. *Bertrand*, inspector general of roads and bridges.

Avis important sur l'Economie Politique et Rurale des Pays de Montagnes, et sur la Cause et les Effets progressifs des Torrens, &c. Paris, in 8vo.

1794. *Fontalard, Jean Francois* de, of Lorrain.

Principes raisonnés d'Agriculture, ou l'Agriculture démontrée par les Principes de la Chimie Economique, d'après les Observations de plusieurs Savans; Ouvrage traduit en Français, sur la Version Latine de Jean Gottschalk Valerius de Stockholm. Paris, an ii.

1794. *Huzard, Jean Baptiste*, veterinary surgeon of Paris, and member of several societies; Madam Huzard is the principal agricultural bookseller of Paris, as Harding is of London.

1. Essai sur les Maladies qui affectent les Vaches laitières des Environs de Paris, in 8vo.

2. Comte rendu à l'Institut de la Vente des Laines, et de 161 Bêtes du Troupeau National de Rambouillet, faite en prairial, an ix. in 4to. 1801.

3. Comte rendu à la Classe des Sciences, Mathématiques et Physiques de l'Institut National des Améliorations qui se fondent l'Etablissement Rural de Rambouillet, et Principalement de celle de Bêtes à Laine et de la Vente qui a eu lieu le 26 prairial, an xi. in 4to. 1803.

1794. *Preaucau, Chemilly Eugene*.

Des Haies considérées comme Clôtures; de leurs Avantages et des Moyens de les obtenir, in 8vo.

1795. *Cels, Jacques Martin*, member of the Institute, of the Paris agricultural society, &c.

1. Annuaire du Cultivateur, ou Répertoire universel d'Agriculture, in 4to.

2. Avis sur les Recoltes des grains, publiée par le Conseil d'Agriculture du Ministère de l'Intérieur. Paris, in 8vo. (an vi.)

3. Instruction sur les Effets des Inondations et débordemens des Rivières, relativement aux Prairies, aux Recoltes de Poins, in 8vo. 1802.

1797. *Gilbert, Francois-Hilaire*, born at Châtellerauld, in 1757, died at St. Ildefonso, near Madrid, in 1800, when in search of a flock of merinos; a man of great zeal for agriculture.

1. Instruction sur les Moyens les plus propres à assurer la Propagation des Bêtes à Laine de Race d'Espagne et la conservation de cette Race dans toute sa pureté, publiée par le Conseil d'Agriculture, in 8vo.

2. Mémoire sur la tonte du Troupeau National de Rambouillet, la Vente de ses Laines et de ses Productions disponibles, in 4to. 1797.

3. Recherches sur les Espèces de Prairies artificielles qu'on peut cultiver avec le plus d'Avantage en France. Paris, in 12mo. 1799.

1798. *Barbe-Marbois*, of Metz, who filled various civil offices, and was a grand officer of the legion of honor.

1. Culture du Trèfle, de la Luzerne et du Sainfoin. Metz, in 8vo.

2. La Richesse des Cultivateurs, ou Dialogues entre Benjamin Jachère et Richard Trèfle, Laboureurs, sur la Culture du Trèfle, de la Luzerne, et du Sainfoin. in 8vo. 1805.

1799. *Lasteyrie, Charles-Philibert*, de, member of various literary, philosophical, and agricultural societies, an active patriot and general philanthropist.

1. Traité des Bêtes à Laine d'Espagne; leur Voyages, la Tonte, le Lavage, et le Commerce des Laines, les Causes qui donnent la finesse aux Laines: auquel on ajoute l'Histoire des Voyages que font les Moutons des Bouches du Rhône et ceux du Royaume de Naples; l'Origine, les Succès, l'Etat actuel du Troupeau de Rambouillet, et les Moyens de propager et de conserver la Race Espagnole dans toute sa pureté. in 8vo.

2. Histoire de l'Introduction des Moutons à laine fine d'Espagne dans les divers États de l'Europe, et au Cap de Bonne-Espérance Etat actuel de ces Animaux; différentes Manières dont on les élève, les Avantages qu'en retirent l'Agriculture, les Fabriques, et le Commerce. 2 vols. in 8vo. 1805.

3. Mémoires sur différents points d'Economie Rurale. Paris, an vii.

4. Du Cotonnier et de sa Culture, ou Traité sur les diverses Espèces de Cotonniers, sur la Possibilité et les Moyens d'acclimater cet Arbruste en France, sur sa Culture dans différents Pays, principalement dans le Midi de l'Europe, et sur les Propriétés et les Avantages économiques, industriels, et commerciaux du coton. Paris, in 8vo. avec Planch. 1808.

5. Collection de Machines, d'Instruments, &c. employés dans l'Economie, Rurale, Domestique, et Industrielle, d'après les dessins faits dans diverses parties de l'Europe. 2 vols. in 4to. 200 Planches avec Texte. Paris, 1820.

1800. *Ducaudic*, a great bee master.

Notice sur les Tourbières et sur le Manière de les exploiter; avec l'Art d'en créer dans toutes les Propriétés Rurales, pour augmenter la Quantité des Engrais et des Combustibles. Lait de Vaine. 8vo.

1800. *Fabre*.

Essai sur la Théorie des Torrens et des Rivières, contenant les Moyens les plus simples d'en empêcher les Ravages, d'en rétrécir le Lit, et d'en faciliter la Navigation. Paris, in 4to.

1801. *Dralet*, of Toulouse, conservateur of forests, member of several societies. In 1810, his *Mole Catcher* had gone through nine editions. (*Bibliog. Agronomique*, 315.)

L'Art du Tapisier, in 8vo.

1801. *Lacoste*, of Plaisance, professor of Natural History at Clermont-Ferrand, and afterwards of morals at Toulouse.

Quelques Observations concernant l'Agriculture dans les Montagnes du Département du Puy-de-Dôme, in 8vo.

1802. *Daubenton, Jean Louis Marie*, co-operator with Buffon in the composition of his Natural History. "Buffon," says Cuvier "only listened to his imagination, while Daubenton always dreaded the influence of that frailty of his mind."

Instruction pour les Propriétaires de Troupes, avec d'autres Ouvrages sur les Moutons et sur les Laines, in 8vo.

1802. *Fromage de Feugri, C. Michel F.*, veterinary professor of Alfort, and author of many works on his profession.

Des Chenilles, des Avoines, et des Moyens d'empêcher leur Ravages. Paris, 8vo.

1802. *Pictet, Charles*, of Geneva, one of the conductors of the *Bibliothèque Britannique*.

1. Faits et observations concernant la race des Mérinos d'Espagne à Laine superfine, et les Croisemens, in 8vo.

2. Quelques faits concernant la Race des Mérinos d'Espagne, à Laine superfine. Genève, in 8vo. fig., an vii.

3. Comparaison de trois Charrues. 8vo. pp. 123. avec planches. Genève. 1823.

1802. *Rauch, F. A.*, engineer of roads and bridges. Harmonie hydro végétale et Météorologique ou Recherches sur les Moyens de recréer, avec nos Forêts, la Force des Tempêtes et la Régularité des Saisons par des Plantations raisonnées. 2 vols. in 8vo.

1803. *Deprad, D.*, archbishop of Malines, ambassador of Buonaparte at Warsaw, and, since the restoration of the Bourbons, author of various political works, which have excited considerable interest. De l'Etat de la Culture en France, et de ses Améliorations. 2 vols. in 8vo.

1803. *Dourches, Charles*, member of several societies.

1. Traité des Prairies et de leurs Irrigations, in 8vo.

2. Aperçu Général des Forêts. 2 vols. in 8vo. (an xiii.)

1803. *Sincty, André Louis Esprit*, member of several societies.

L'Agriculture du Midi, ou Traité d'Agriculture propre aux Départemens Méridionaux, &c. Marseille, 2 vols. in 12mo.

1804. *Jacquelin, M. E.*

Instructions sur l'Economie rurale et domestique aux Habitans des Campagnes, Publiées par la Société d'Agriculture du Département des Deux-Sèvres, in 8vo.

1805. *Aigoin*, member of the Agricultural Society of Iverre.

Mémoire sur l'Amélioration du Troupeau de Mérinos et de Bêtes à Laine indigènes établi à la Mandria de Chives, Département de la Loire, et sur les progrès de l'Agriculture dans ce département, in 8vo.

1805. *Toillard, Claude*, a physician, member of various societies, and who visited most parts of the continent; afterwards a nurseryman near Paris, and finally a corn merchant.

Traité des végétaux qui composent l'Agriculture de l'Empire Français, &c. in 12mo.

1806. *Bagot*, member of the Agricultural Society of the Seine.

1. Mémoire sur les Produits du Topinambour, Comparé avec ceux de la Luzerne, et de plusieurs racines légumineuses. Paris.

2. Annales de l'Agriculture Française, contenant des Observations et des Mémoires sur toutes les Parties de l'Agriculture.

1807. *Gacon Dufour, Marie Armande Jeanne*.

Dictionnaire Rural Raisonné, dans lequel on trouve le Detail des Plantes Preservatives et curatives des Maladies des Bestiaux.

1807. *Morel de Vindé*.

Mémoire sur l'Exacte Partit des Laines Mérinos de France et des Laines Mérinos d'Espagne, suivi de quelques éclaircissements sur la vraie Valeur que devraient avoir dans le Commerce les Laines Mérinos Françaises, in 8vo.

1807. *Prevost, Bénédicte*

Mémoire sur la cause immédiate de la Carie ou Charbon des Blés, et de plusieurs autres Maladies des Plantes et sur les Preservatives de la Carie Montaban. in 8vo.

1809. *Calvet, Etienne*, member of the Museum of Toulouse, and of other societies, author of various scientific works on rural subjects.

Mémoire sur l'Ajone ou Gené épineux considéré sous le Rapport de Fourrage, de l'Amendement des Terres Stériles et du Supplément au Bois. Paris, in 8vo.

1812. *Thouin, M. André*, le Chevalier de, professor of culture in the University of Paris; author of various memoirs on gardening and agriculture, inserted in the French encyclopædia, dictionaries, and periodical works, and in the transactions of their learned bodies; an excellent man, and esteemed one of the first gardeners in Europe. He died in 1833. (See *Encyc. de Gard.* p. 117.)

Description de l'Ecole d'Agriculture Pratique du Museum d'Histoire Naturelle. 4to.

1816. *Bonnecmain*, a physician, member of several societies.

Observations sur l'Art de faire éclore et, à élever la Volaille sans le secours des Poules, ou Examen des causes qui ont pu

empêcher aux Vénitiens Tentatives qui ont été faites en Europe, pour imiter les Egyptiens. Paris, in 8vo pp. 36.

1816. *Chatelet, le Chevalier*, a cavalry officer. Mémoire sur les Chevaux Arabes; Projet tendant à améliorer et à améliorer les Chevaux en France; Notes sur les différentes Races qui doivent être préférées à ce sujet, &c. &c. Paris, 8vo.

1817. *Bornot, M. A.*, a notary at Savoisy. Pratique raisonnée de la Culture du Trèfle et de Sainfoin. Paris, 8vo. pp. 100.

1818. *Avrouin, Foulon*, mayor of Semblançay. Essai sur les défrichemens des Landes, et le dessèchement des Marais. Tours, 8vo. pp. 40.

1819. *Lullin, Ch. J. M.* Des Prairies artificielles d'été et d'hiver; de la Nourriture des Bœufs, et des améliorations d'une Ferme dans les Environs de Gênes, 2^e édit. revistée et considérablement augmentée. Genève, 8vo. pp. 532.

1819. *Peyrouse, Baron Picot de La*. A Sketch of the Agriculture of a District in the South of France. Translation with Notes. 8vo.

1819. *Villemeur, Comte Louis de*. Essai d'un Manuel d'Agriculture ou Exposition du Système de Culture suivi pendant 19 ans dans le Domaine d'Haeterive, Commune de Carcass, Département du Tarn. Toulouse, 8vo. pp. 908.

1819. *Ycart, A. Victor*, member of the Institute, and one of the writers in the *Nouveaux Cours d'Agriculture*, &c.

1. Excursons Agronomiques en Auvergne, principalement aux Environs des Monts d'Or et de Puy-de-Dôme; suivie de Recherches sur l'Etat et l'Importance des Irrigations en France. Paris, 8vo. pp. 218.

2. Considérations Générales et particulières sur la Jachère et sur les meilleurs Moyens d'arriver graduellement à sa suppression avec de grands avantages. Imprimé par ordre de la Société Royale et Centrale d'Agriculture. Paris, 8vo. pp. 220. avec planches. 1822.

1820. *Audouin, Maurice*. Exposé du Projet d'établissement d'une Ferme expérimentale dans chaque Département du Royaume. Paris, 8vo. pp. 8.

1820. *Crud, Le Baron E. V. B.* the translator of Thae's works from the German. Economie de l'Agriculture. Genève, 4to. pp. 414.

1820. *Deslandes*. Eléments de l'Agriculture et des Sciences qui s'y rapportent, &c. Paris, 2 vols. 12mo. pp. 600.

1821. *Guillaume, Ch.* Instrumens aratoires, inventés, perfectionnés, dessinés, et gravés. Par Ch. G. Paris, oblong folio. pp. 28. avec 12 planches.

1821. *Lafons, M. de*, mayor of Aligat. Abrégé élémentaire d'Agriculture pratique, d'après les principes de Rozier, Arthur Young, Duhamel, &c.; principes appliqués à la Nature du Solles Pyrénées, à sa Température, &c. Toulouse, 8vo. pp. 532. avec fig.

1822. *Adamson, Madame Aglaé*. La Maison de Campagne. Paris, 3 vols. 18mo. pp. 1098.

1822. *France, Aimé*.

L'Art de la Stercoration, ou les Loixes d'un Agriculteur Praticien retiré à la Campagne; Méthode pour fabriquer une Quantité immense de Fumiers qui dureront 8 Ans, tandis que les Fumiers ordinaires sont évaporés dans deux années. Toulouse, 8vo. pp. 48.

1822. *Moré de Vindé*, peer of France.

1. Quelques Observations pratiques sur la Théorie des Assolements. Paris, 8vo. pp. 80.

2. Essai sur les Constructions rurales économiques contenant leurs Plans, Coupes, Elevations, Détails, et Dévis établis aux plus bas Prix possibles. (Les détails de Constructions et divisa, par A. L. Luson, Architecte.) Paris, in folio. pp. 40. avec 36 planches.

1822. *Morogues, Baron de*.

Essai sur les Moyens d'améliorer l'Agriculture en France, particulièrement dans les Provinces les Moins riches, et notamment en Souleigne. Paris, 2 vols. 8vo. pp. 332.

1822. *Thiery, P. J.* (officier comptables du dépôt royal d'étalons de Strasbourg.)

Mémoire sur l'Amélioration des Chevaux en Alsace, par le croisement des Races et l'Éducation, et particulièrement sur le Moyens de les préserver de la Cécité. Mémoire Couronné, &c. Strasbourg, 4to. pp. 160. 1822.

1822. *Polignac, Comte Charles de*.

Rapport au Roi sur les Troupeaux de pure Race, expliquant les Motifs et le Développement des nouveaux Principes d'Administration, pratiqués dans son établissement rural de Calvados. Paris, 8vo. pp. 132.

1823. *Chapal, Comte*, a distinguished chemist and statesman, who cultivates a considerable part of his own estate.

La Chimie appliquée à l'Agriculture. Paris, 2 vols. 8vo.

1823. *Boac, Th.* vice president of the Société d'Agriculture du Dents.

1. Rapport sur l'emploi du Plâtre en Agriculture fait au Conseil Royal d'Agriculture. Paris, 8vo. pp. 108.

2. Traité élémentaire de Physique végétale appliquée à l'Agriculture. Paris, 1824. 8vo. pp. 110.

1824. *Dubois, Louis*.

Cours complet et simplifié d'Agriculture et d'Economie rurale et domestique. Paris, 6 vols. 12mo.

1824. *Mathieu de Dombasle, C. J. A.*

Annales Agricoles de Roville, ou Mélanges d'Agriculture, d'Economie rurale et de Legislation Agricole. Première livraison. Paris, 8vo.

1824. *Mortemart-Boisse*, le Baron de.

Recherches sur les différentes Races des Bêtes à Laine de la Grande Bretagne, et particulièrement sur la nouvelle Race de Leicestershire. Paris, 8vo.

1824. *Polonceau, M.*

Notice sur les Chèvres Asiatiques à Duvet du Cachemere, et sur un premier Essai tenté pour augmenter leur Duvet, et lui donner des Qualités nouvelles, &c. Paris, 8vo.

1825. *La Société d'Agriculture de Paris*.

Annuaire de la Société Royale et Centrale d'Agriculture. 8vo. (Continued Annually.)

SUBJECT. 2. Bibliography of German Agriculture.

7113. The German agricultural works are as numerous as those of the French, but chiefly translations, and these, for the most part, from the English. We have given a very limited selection, the German language being less generally understood than either the French or Italian. In forest management (*Forstwissenschaft*) the German bibliography is very rich, and it is chiefly these books, and descriptions of local practices, which can be of any interest to the British cultivator. The older German works in rural affairs are enumerated in Haller's *Bibliography*; and the modern ones, and new editions in Ersch's *Handbuch der Deutschen Litteratur*, and the *Leipsic Catalogues*, published annually. Thae's *Moeglin* is decidedly the highest in repute as an author, and Sickler's *Deutsche Landwirthschaft*, a voluminous work, will give a general idea of every part of German husbandry.

1578. *Herzbachius, Conradus*, counsellor to the Duke of Cleve; was born in 1508, died in 1576. He wrote various theological works, besides his *Rei Rustice*, libri iv., which was published in 1570, and his *Legum rusticarum, et operum per singulos Menses digesta*, in 1595. The former was translated by Barnaby Gooch, of Lincolnshire, with the following title:

Four Books of Husbandrie, containing the whole Art and Trade of Husbandrie, Gardening, Graffing, and Planting, with the Antiquite and Commendation thereof. Newly Englished and increased by Barnebo Gooch, Esquire. At London, 4to. 1578. Leaves 154, besides the Dedication, Epistle and Table at the beginning; and Old English Rules in Verse for purchasing Land, at the end.

His authorities extend from the Bible and doctors of the church, through the Greek and Roman writers, Homer, Cato, &c., to the moderns as low as Ruellius, Fuchsius, Matthiolus, Cardanus, and Tragus. He subjoins a list of his friends and others who assisted him. S. Nich. Malbee, M. Cap. Byngham, M. John Somer, M. Nicas. Yetzwert, M. Fitzherbert, M. Willi. Lambert, M. Tussar, M. Tho. Whetenhall, M. Ri. Deering, M. Hen. Brookhull, M. Franklin, H. King, Richard Andrews, Henry

Denys, William Pratte, John Hathe, Philip Partridge, Kenworth Dafforth.

The work is in dialogue. The persons are Cono, a gentleman retired into the country; Rego, a courtier; Metella, wife of Cono; and Hermes, a servant.

1591. *Colerus, J.*

1. Calendarium oeconomum et perpetuum. Witteberge.
2. Economie pars prima, qua tractatur quomodo bonus oeconomus famulus suo regere debet et bona sua augere potest per veras honestas artes, et utilis compendia circa res domesticas, Agriculturam, Piscatum, Aucupium, Venationem et Vinarum Cultum. Wittebergium, 4to. 1593.

1592. *Porta, J. B.*

Vilae, lib. xiii. Francofurti, 4to.

1735. *Zeigerus, Antoine*.

Introductio rationalis ad oeconomiam et artem persciende Agriculture, in qua methodus experientia confirmata omnegnis agrorum sine consueti stercoreatione secundandi. 4to.

1754. *Eckhart, J. Gll. von*.

Experimental Oekonomie über das Animalische, Vegetabilische, und Mineral Reiche, oder vollständige Haushaltung- und Landwirthschaftskunst. Jena, 1754. 8vo.

1760. *Der Schuetzer*.

Gesellschaft in Bern Sammlung von Landwirthschaftlichen

Dingen; oder Abhandlungen und Beobachtungen durch die ökonomische Gesellschaft in Bern gesammelt. Zurich, 8vo.

1762. *Wiegand, J.*
Wohlfahrter Landwirth; oder Anleitung wie der Landwirthschafts Oekonomie zu verbessern. Wien, 8vo.

1763. *Cramer, John Andrew*, died 1777.
Anleitung zum Forstwesen. Braunschl. fol.

1763. *Delecluse*.
Mémoires de l'Agriculture en générale, et de l'Agriculture de Pologne en particulier. Berlin, 8vo.

1769. *Lüders, Ph. E.*
Grundriss einer zu errichtenden Aekerschule, in welcher die Landjugend zu einer richtigen Erkenntnis und Uebung im Landbau eingeführt und zubereitet werden könne. Flensburg, 8vo.

1773. *Krünitz, J. G.*
Ökonomische technologische Encyclopädie, oder allgemeines System der Staats, Stadt, Haus, und Landwirthschaft in Alphabetischer Ordnung. Berlin, 8vo.

1775. *Albrecht, J. F. E.*
Zootomische und Physikalische Entdeckungen von der innern Einrichtung der Thiere, besonders der art ihrer begattung. Gotha, 8vo.

1775. *Suckow, G. Adg.*
Abhandlung vom Nutzen der Chemie zum Behuf des bürgerlichen Lebens und der Oekonomie. Mannheim, 8vo.

1779. *Borcke, H. A. Grafen*, Count de.
Account of the Management of his Estate of Stargord, in Pomerania. Berlin, 4to. in German.

1780. *Christ, J. L.*
Patriotische Nachrichten, &c.; or, Patriotical Accounts and Instructions concerning the profitable Culture of Tobacco, and more especially of that called Asiatic Tobacco. Francf. 8vo.

1781. *Rössig, Karl Glo*, author of some works on gardening and forest management.

Versuch einer pragmatischen Geschichte der Oekonomie, Policey und Cameralwissenschaften, seit dem 16 ten Jahrhundert, bis auf unsere Zeiten. Deutschland Leipzig, 8vo.

2. Die Geschichte der Oekonomie der vorzüglichsten Länder und Völker der alten mittlern und neuern Zeit in einem kurzen Entwurff darzustellen. Leipzig, 8vo. 1778.

1784. *Hiltbrand, Ant.*
Erste Anfangsgründe der zur Landwirthschaft nöthigen Mechanik. Wien, 8vo.

1784. *Hofmann, Gli. Bd. Freyherr von*.
Die Landwirthschaft für Herrn und Diener. Prag, 8vo.

1785. *Fischer, C. F. J.*
Die Fische des Ost und West Handels, der Schiffahrt, Fischerey, Erhaltung, Kunst, Gewer, der Landwirthschaft, Policey der Zapf-Münzen, Bergwesen, der Staatswirthschaft und des Luxus. Pirmsey, 1785, 8vo.

1785. *Hartig, Fr. Grafen von*.
Historische Untersuchung über die Aufnahme und den Verfall der Feldwirthschaft bey verschiedenen Völkern. Prag und Wien, 8vo.

1786. *R. Zedler*.
Brievs et notes de Description. Giesen, 12mo.

1791. *Huber, Georg de-Lang*.
Observations Historiques sur le Progrès et la Décadence de l'Agriculture chez différents Peuples. Vienne, 5 vols. 8vo.

1791.
Kleine Schriften zur Stadt und Landwirthschaft von der ökonomischen Gesellschaft in Bern herausgegeben. Zurich, 8vo.

1791. *Nau, Bh. Seb.*
Theoretisch praktisches Handbuch für Oekonomie, Bergbaukunde, Technologie und Thierarzneiwissenschaft (in Alphabetischer Ordnung) von einer Gesellschaft bearbeitet. Zurich, 8vo.

1792. *Rose, K. Ad. H. von*.
Katechetische Unterricht zum Feldbau oder freundschaftliche Gespräche über die vorzüglichsten Gegenstände der alten und neuen Landwirthschaft, nebst einem Anhange, wie die Wohn- und Wirtschaftshäuser auf kleinen Rittergütern und grossen Bauerngütern bequem und wohlthun anzulegen. Halle, 8vo.

1792. *Riem, J.*
1. Monathlich praktisches ökonomische Encyclopädie für Deutsche, oder zum Zusammenhang oder Lehrbegriff der gemeinnütigen praktischen Wirthschaftskunde, &c. Leipzig, 8vo.

2. Modell Magazin für Oekonomen; oder Abbildungen und Beschreibungen der nützlichsten und bequemsten Geräthschaften, Werkzeuge und Geschirre für Haushaltung, Landwirthschaft, Viehzucht, &c. Leipzig 1802, 4to. mit Kupfern.

1794. *Stumpf, G.*
Geographie und Statistike des ökonomischen cameralischen Instituts zu Jena; mit den nöthigen Documenten. Jena, 8vo.

1796. *Huber, Francis*, member of the Society of Natural Philosophy and Natural History of Geneva.

Nouvelles Observations sur les Abeilles, adressées à M. Charles Bonnet. Par. 12mo.

1798. *Zehner, Ch. H. Edf. von*.
System der Landwirthschaft, nach physischen und chemischen Grundsätzen behandelt, und durch lange Erfahrungen geprüft. Leipzig, 8vo.

1797. *Fischer, H. L.*
Katechismus der Haushalt und des Ackerbaues zum Gebrauch in Schulen. Br. in zweig, 8vo.

1797. *Krätz, Gerdann*.
De l'Agriculture comme source principale du Bien-être et de la Prospérité d'une Nation. Vienne, 8vo.

1798. *Thaer, Alb.*, of the establishment of M. Gelin in Prussia, one of the most enlightened Ger-

man agriculturists, author of numerous works, all in high repute. (572.)

1. Einleitung zur Kenntniss der Englischen Landwirthschaft. Hannover, 8vo.

2. Vermischte Landwirthschaftliche Schriften aus der drey ersten Jahrgängen der Annalen der niederrheinischen Landwirthschaft, ausgewählt und anzuweisung in Ansehung der eignen Arbeiten verbessert. Hannover, 8vo. 1806.

3. Grundsätze der rationalen Landwirthschaft. Berlin, 4to. 1809.

4. Annalen der niederrheinischen Landwirthschaft herausgegeben von der Braunschweigischen Landwirthschafts Gesellschaft durch Alb. Thaer und J. Kr. Besencke. Zelle. 8vo. 1799.

1799. *Anton, K. Glo*.
Versuch einer Geschichte der deutschen Landwirthschaft von den ältesten Zeiten bis zu Ende des 15 ten Jahrhunderts. Götting, 8vo.

1804. *Rückert, G. Ch. Alb.*
Bemerkung über Thaers Einleitung zur Kenntniss der Englischen Landwirthschaft. Wien, 8vo.

1800. *Steinzel, A. H. von*.
Bemerkungen über Thaers Schreiben, &c. Leipzig, 8vo.

1801. *Huber, P.*, of Lausanne, in Switzerland, and son of Francis, previously mentioned.

1. Mémoires concerning the Influence of the Air, and several gaseous Substances, on the Germination of various kinds of Grain. Geneva, 8vo.

2. Recherches sur les Mœurs des Fourmis Indigènes. Par. 1810.

1802. *Costa, Ch.*
Essai sur l'Amélioration de l'Agriculture dans les Pays Montueux et en particulier dans la Savoie. 8vo.

1802. *Eschenbach, Ch. Adg.*
Kunstmagazin der Mechanik und technischen Chemie; oder Sammlung von Abbildungen und Beschreibungen erprobter Maschinen, zur Vervollkommen des Ackerbaues, der Manufacturen und Fabriken. Leipzig, 4to.

1802. *Gottward, J. Ch.*
Das Ganze der Landwirthschaft; ein Systematisches Lehrbuch, welches jedem wie für jeden, der sich dieser Wissenschaft widmet. Mainz, 8vo.

1803. *Engel, Lud. Hm. Hs. von*.
Anwendung der Englischen Landwirthschaft auf die Deutsche und beide gegen einander gestellt nach Thaer's Einleitung. Leipzig, 8vo.

1803. *Hermstadt, Sgm. F.*
Archiv der Agricultur-Chemie, für denkende Landwirthe; oder Sammlung der wichtigsten Entdeckungen, Erfahrungen und Beobachtungen in der Physik und Chemie, &c. Berlin.

1807. *Weber, F. Ed.*
Handbuch der ökonomischen Literatur; oder Systematische Anleitung zur Kenntniss der Deutschen ökonomischen Schriften, die sowohl die gesammte Land- und Hauswirthschaft, als die mit ihr verbundenen Hufe- und Nebengewerkschaften angehen; mit Angabe ihres Ladenpreises und Bemerkung ihres Werthas. Berlin, 8vo.

1804. *Richter, K. F.*
1. Chemisch ökonomisches Taschenbuch für Wirthschaftsbeamte, oder Darstellung der chemischen Elementargesetze welche mit der Oekonomie in der engsten Verbindung stehen. Chemnitz und Leipzig, 8vo.

2. Historische, tabellarische Darstellungen der in jedem Monate vorkommenden Landwirthschaftlichen Arbeiten auf jedes Jahr anwendbar, für Rittersgutsbesitzer, Pächter und Verwalter. Chemnitz und Leipzig, fol. 1804.

1805. *Sickler, F. Ch. L.*, son to the celebrated German pomologist, and author of some interesting gardening works. (See *Encyc. of Gard.* p. 1193.)

Le Spirodiaphre, ou Char à Planter le Bê, avec deux planch. Paris, 8vo.

1798. *Fellenberg, Emmanuel*, of the celebrated agricultural establishment in Switzerland already noticed (343.)

1. Rapport à S. Ex. le Landammann et à la Diète des 19 Cantons de la Suisse, sur les Etablissements agricoles de M. Fellenberg à Hofwyl, par M. M. Hoer, &c. Paris et Genève, 8vo.

2. Vues relatives à l'Agriculture de la Suisse, et aux Moyens de la perfectionner. Genève, 1808.

3. Anstalten der schweizer Landwirthschaft und des zwecknüssigsten Mittels sie zu vervollkommen. Carlsruhe, 8vo. 1809.

1808. *Escher, von Berg*.
Briefe über die Fellenbergische Wirthschaft zu Hofwyl. Zurich, 8vo.

1808. *Theress, Thdr.*
Theoretisch-Praktisches Handwörterbuch der gesammten Landwirthschaft; oder Anweisung zur Kenntniss, Behandlung und Benutzung aller Landwirthschaftlichen Gewächse; als des Feld- und Gartenbaues, der Viehzucht, &c. Göttingen, 8vo.

1809. *Hoffmann, A.*
Ueber Fellenbergs Wirthschaft in Hofwyl; nebst Anmerkungen und eine Nachschrift von Alb. Thaer (aus den Annalen des Ackerbaues). Berlin, 8vo.

1809. *Schöffel, L.*
Berichtigung des hebräischen National Rapports über die Landwirthschaftlichen Anstalten des Herrn Em. Fellenbergs zu Hofwyl. Erlangen, 8vo.

1809. *Trantman, Ch.*
Lehrplan der Landwirthschaft. Wien, 8vo.

1810. *Schönlentner, M.*
Nachrichten über die königliche Landwirthschaftsschule in Weihenstephan und über das dort eingeführte Thaersche Ackerystem. München, 8vo.

SUBJECT. 3. *Bibliography of Italian Agriculture.*

7114. A number of *Italian agricultural works* have been published: such as they are, perhaps more of them are original than the books of the French or Germans, because the culture of other parts of Europe is but ill adapted for Italy. The vine, olive, mulberry, orange, and the irrigation of lands, have a good deal occupied the Italian writers. Re may be reckoned their general and popular author, and his *Nuovi Elementi*, 4 vols. 8vo. 1815, and *Annali dell'Agricoltura*, &c. 22 vols. 8vo. to 1814, will give a good idea of Italian husbandry and gardening, the two arts in that country being for the most part combined.

1471. *Crescentius*, *Crescenzo*, or *De Crescentiis*, was born at Bologna about 1233; died 1320.
1. Opus Rurarium Commodorum sive de Agricultura, libri xlii. Augsburg, fol.
2. De Agricultura, Omnibusque Plantarum et Animalium Generibus. Basil, 1538.

1496. *Bertolucci*, *Dionysius*, of Bologna, who printed some very early works at Vicenza.
Scriptura de Re Rustica. This contains the Agricultural works of Columella, Varro, Cato, and also of Palladius, &c.

1546. *Alamanni*, *Luigi*.
Della Coltivazione. Rome. 8vo.

1564. *Gallo*, *Agostino*.
1. Le dieci giornate della vera Agricoltura, e Piaceri della villa: in Dialogo. Bresc. ap. G. B. Bozzola. 4to.

2. La Vinti Giornate dell'Agricoltura, e de' Piaceri della villa. Turin, 1579. 4to.

1622. *Soderini*, *Giovannettorio*, e *Bernardo Davanzoli*.

Cultivazione Toscana delle viti e d'alcuni altri. Aggiuntori coltivazione degli ulivi, di Pietro Vettori. Firenze. 4to.

1623. *Castelli*, *Benedict*, an Italian mathematician, and the particular friend of Galileo, was born at Brescia, in the year 1577; died about 1640.

Treatise of the Measurement of Running Waters; also Letters and Considerations touching the Draining of Fens, Divisions of Rivers, &c. Translated by Thomas Salisbury. Lond. 1641. fol. Published at Rome in 1628.

1651. *Fanara*, *Vincenzo*.
L'Economia del Cultivatore in villa. Roma, in 4to.

1718. *Borro*, *Alessandro*.
Dimostrazioni e prove sopra l'Altitvità, ed uso vantaggioso del Gran Coltro. Milano, in 4to. fig.

1736. *Aquino*, *Charles d'*.
Nomenclatur Agriculture. Rome; in 4to.

1758. *Gavellus*, *Nicholas*.
Storia distinta, e curiosa del Tabacco, concernente la sua scoperta, la introduzione in Europa, e la Maniera di coltivarlo, conservarlo, e prepararlo. Pesaro. 8vo.

1764. *Alamanni*.
La Coltivazione e gli epigrammi, colle Api di Gio. Rucellai, ed annotaz. Parma, in 12mo.

1767. *Cattaneo*, *Giacomo*.
Della Idropisia de' Geai. Milano, in 8vo.

1772. *Tarcello*, *Camillo*.
1. Ricordo d'Agricoltura colle note del Padre Scottoni. Venezia, in 4to.

2. Ricordo d'Agricoltura corredato d'Annotazioni da Paolo Sangiorgio. Milano, 1816, in 8vo.

1776. *Canciana*.
Saggi sopra la Legislazione propria alle arti dell'Agricoltura. Udine, in 8vo.

1777. *Salvini*, *Gio*.
Istruzione al suo fattore di campagna, in cui si dà una piena notizia di tutto ciò che appartiene alla maggior promozione dell'arte agraria, e suoi metodi, &c. Venezia, in 8vo.

1778. *Cantani*, *Carlo Antonio*.
Istruzioni pratiche intorno all'Agricoltura, e tenuta dei Biagatti. Bergamo, in 8vo.

1778. *Castellet*, *Costanza*.
Istruzioni circa il modo di coltivare i geli, di allevare i bachi da seta, e di filar le sete, con nuove applicazioni e riflessioni. Torino, in 8vo.

1778. *Bidet*, *M*.
Trattato sopra la coltivazione delle viti; del modo di fare i vini e di governarli. Venezia, in 8vo. fig.

1780. *Bertani*.
Elementi di Agricoltura fondati sui fatti e sui rascioli ad uso delle persone di campagna. Vicenza, in 8vo.

1780. *Carrera Antonio*.
Dissertazione sull'Economia Rurale. Venezia, in 8vo.

1781. *Brugnone*, *Gio*.
1. Trattato delle razze de' cavalli, col disegno della fabbrica della regia mandra di Chivasso, e quello dei pascoli e prati. Torino, in 8vo. fig.

2. Boometria, o sia della conformazione esterna del corpo delle bestie bovine, delle loro bellezze e difetti, e delle avvertenze da avervi nella loro compra. Torino, 1802, in 8vo.

3. Ippometria, o sia della conformazione esterna del Cavallo, dell'Asino e del Mulo, delle loro bellezze e difetti, e delle attenzioni da avervi nella loro compra. Torino, 1802, in 8vo.

1785. *Amoretti*.
1. Istruzioni pubblicate della Società Patriottica di Milano, intorno ad alcuni quesiti della medesima proposti per l'anno 1785, in 4to.

2. Della coltivazione delle patate e loro uso. Milano, 1801, in 8vo. fig.

3. Delle Tardiere esistenti nel dipartimento d'Olona e limirosti, e dei loro vantaggi ed usi. Milano, 1807, in 1to.

4. Coltivazione delle Api nel Regno d'Italia. Milano, 1811, in 8vo. fig.

5. Della Torba e della lignite nel Regno d'Italia. Milano, in 8vo. fig.

6. Domande relative all'Agricoltura. Mil. in 4to.

1785. *Barbara*, *Marco*.
Esperimenti sopra il grano fermentato, ed altre agrarie scoperte. Milano, in 8vo.

1790. *Rocca*, *Abbe Della*, vicar general of Scyros.
Traité complet sur les Abeilles, &c. &c. A Complete Treatise on the Management of Bees, as practised at Scyros, together with an Account of that Island. Paris. 8vo.

1791. *Caronelli*, *Pietro*.
1. Apotelemi Agrarii, o sia istruzioni per via di massime tratte dalle opere de' due insigni agronomi Catone e Varrone. Venezia, in 8vo.

2. L'Agricoltura Italiana ridotta in proverbi, ovvero istruzioni per via di massime tratte dalle opere de' due insigni agronomi Catone e Varrone. Venezia, 1807, in 8vo.

1793. *Lastri*, *Proposio*.
Calendarj dodici, o sia Corso completo d'Agricoltura pratica. Venezia. vol. iv. in 8vo.

1798. *Comparetti*.
Saggio sulla cultura e governo dei Boschi. Padova, in 8vo.

1798. *Doria*, *Luigi*.
Istituzioni geografiche per la Coltivazione de' grandi ad uso delle campagne romane. Roma, in 8vo. fig.

1800. *Livy*, *Cav*.
Three Memoirs on Agriculture; 1. On the Use of the Alga Marina in Agriculture and in the Arts; 2. On the Treatment of Vines; 3. On the Economy of the Flour which flies away in the Mill, and during the separation of the Bran. Palermo.

1801. *Simonde*, *J. C. L.*, a distinguished literary character who formerly managed an estate in the Vale of the Arno.

Tableau d'Agriculture Toscane. Genève.

1802. *Fabroni*, *Adamo*.
Dissertazione sopra il quesito: indicare le vere Teorie, con le quali devono eseguirsi le sime dei terreni, &c. Firenze, in 8vo.

2. Della economia agraria del Chinesi. Memoria. Venezia, 1802, in 8vo.

1802. *Targioni*, *Luigi*.
1. Lezioni di Agricoltura specialmente Toscana. Firenze, vol. vi. in 8vo.

2. Memorie su l'Agricoltura, la Pastorizia, e l'Applicazione dei Naturali prodotti agli usi degli abitanti dell'Italia, ed alla loro industria. Napoli, 1814. vol. ix., in 8vo. fig.

1803. *Carradori*, *Gioacchino*.
Della fertilità della terra. Pisa, in 8vo.

1803. *Valicé*, *Alexandre*.
Instructions élémentaires d'Agriculture, ou Guide Nécessaire au Cultivateur, traduit de l'Italien de Fabroni.

1804. *Ronconi*, *Ignazio*.
Dizionario d'Agricoltura, o sia la Coltivazione Italiana, in cui si contiene la cultura e conservazione dei diversi prodotti rurali, e le terre seminatrici, i prati, i boschi, le vigne, ed i giardini, &c. Venezia, vol. v., in 8vo.

1805. *Piacenza*, *Giovanni*.
Nuovo metodo di fare le misure dei fieni, a che si aggiunge qual sia la migliore Agricoltura de' prati. Milano, in 8vo.

1807. *Barelli*, *Giuseppe*.
1. Della Malaria della Gölpe del grano turco. Milano, in 8vo. fig.

2. Saggio intorno la Fabricazione del Cacio detto Parmigiano. Milano, 1808, in 8vo.

3. Monografia Agronomica dei Cereali del Frumento, trattato diviso in tre parti. Milano, 1809, in 8vo., con rami e tavole.

1807. *Birolli*, *Giovanni*.
1. Del riso, trattato economico rustico. Milano, 8vo.

2. Trattato di Agricoltura. Novara, 1812, vol. iv. in 8vo. con tavole.

1807. *Galcotte*, *Francesco*.
Metodo per migliorare ed accrescere l'Agricoltura nello stato di Parma. Parma, in 8vo.

1807. *Gautieri*, *Giuseppe*, inspector of woods and forests to the Viceroy of Lombardy, author of a tract on forests. (See *Encyc. of Gard.* p. 1128.)

1. Della ruggine del Frumento. Milano, in 8vo. fig.

2. Dei vantaggi e dei danni derivanti delle capre in confronto delle pecore. Mil. 1816, in 8vo.

1808. *Abbate*, *Antonio*.
Coltivazione dei Bigatti o sia Metodo pratico per farli nascere, coltivarli nei vari periodi della loro vita, e fabbricarne la semente. Milano, 8vo.

1808. *Re*, *Filippo*, librarian to the Patriotic Society at Milan, afterwards in the employ of Government, at Turin, where he died in 1830 or 1821. He wrote a great number of works on rural and economical subjects.

1. Elementi di economia campestre ad uso de' Licei. Milano, in 8vo. carta fina.
2. Annali dell' Agricoltura del regno d' Italia cominciati in Gennaio 1809, e terminate in giugno, 1814, fascicoli 66, formati 22 vol. in 8vo. con circa 30 rami e tavole.
3. Del Cotone, e delle avvertenze per ben coltivarlo. Milano, 1811, in 8vo.
4. Nuovi Elementi di Agricoltura, volumi 4 in 8. Dedicati a S. A. R. Francesco IV. d' Este, Duca di Modena, ec. ec.
5. Del Letame e delle altre sostanze adoperate in Italia per migliorare i terreni e del come profittarne; Saggio. Milano, 1815, in 8vo.
6. Saggio sopra la Storia e il Coltivamento dell' Erba Medica. Milano, 1817, in 8vo.
7. Saggio storico sullo stato e sulle vicende dell' Agricoltura Antica del paese posto fra l' Adriatico, l'Alpe, e l'Appennino, sino al Fronto. Mil. 1817, 8vo.
1807. *Tupputi, D.*
Réflexions sur l'Etat de l'Agriculture et de quelques autres parties de l'Administration dans le Royaume de Naples, sous Ferdinand IV.; précédées d'une Introduction ou Coup-d'œil sur l'ancien Etat de ce Pays, et suivies d'un Mémoire intitulé, Recherches sur la Plante vulgairement nommée Storia dans le Royaume de Naples, in 8vo.
1809. *Arduinio, Luigi.*
1. Memoria intorno la coltura ed usi economici del Cinosuro Corakan. Mil. 8vo. fig.
2. Nuovo metodo per estrarre lo zucchero dalle canne dell' Olio di Caferia. Padova, 1811, 8vo. fig.
1809. *Tozzetti, Oct. Targ., M.D.,* professor of agriculture at Florence, and director of different national establishments there.
1. Dizionario dei Nomi di Botanica e di Agricoltura, Latino-Italiano e Italiano-Latino. Firenze, 2 vols. 8vo.
2. Lezioni d'Agricoltura. Firenze, 6 vols. 8vo.
1810. *Benetti, Santo.*
L'acconto Fattor di Villa, o sia Osservazioni utili ad un'fattore per il governo della campagna e per la soprintendenza ai Coloni. Venezia. 8vo.
1810. *Spadoni, Paolo.*
1. Modo di coltivare Napo Silvestre detto volgarmente Ravizzone, e del metodo di cavarne l'olio alla maniera dei Bolognesi. Venezia. 8vo.
2. Dello stabilimento, piantagione e conservazione delle siepi, con il disegno per ben formarle. Venezia, 1810. 8vo.
1811. *Albertazzi, Jacopo Antonio.*
Il Padre di famiglia in casa ed in campagna. Milano, vol. vi. 12mo.
1811. *Giacinto, P. Carlo,* professor of botany in Malta.
Agricultural Essays, adapted to the Island of Malta. Messina.
1811. *Lampadius, Augusto Guglielmo.*
Esperimenti sopra lo zucchero di Barbabietole. Novara. 8vo.
1811. *Losana, Matteo.*
Delle Malattie del Grano in erba non curate o ben conosciute. Carnagioni. 8vo.
1811. *Bassi, Agostino.*
1. Il Pastore bene istruito. Milano. 8vo.
2. Dell' utilità ed uso del Pomo di Terra, e del metodo migliore di coltivarlo. Lodi, 1817. 8vo.
1812. *Dandolo, Vincenzo.*
1. Nuovi cenni sulla coltivazione de' Pomi di Terra, e vantaggi della medesima, rapporto al ben essere dell' uomo e dello stato, Lettera al Cav. Filippo Re. Como. 8vo.
2. Enologia, ovvero l'Arte di fare, conservare, e far viaggiare i vini del Regno d' Italia. Milano, 1812, vol. ii. 8vo. fig.
1812. *Lullin, J. M.*
1. Almanach du cultivateur du Leman. Genève, 8vo.
2. Delle praterie artificiali d'estate e d'inverno, del nutrimento delle pecore e miglioramento di una tenuta. Firenze, 1817, vol. ii. 8vo.
3. Des prairies artificielles d'été et d'hiver, de la nourriture des brebis et de l'amélioration d'une ferme dans les environs de Genève. Paris, 1819. 8vo.
- Gagliardo, G. B.*
Catechismo agrario per uso dei curati di campagna e de' fattori delle ville. Napoli, terza edizione, con aggiunte. 8vo.
1815. *Galliziotti, Filippo.*
Sulla dimora alla campagna dei ricchi possidenti e dell' utilità dell' istruzione degli ecclesiastici nell' agricoltura. Firenze. 8vo.
1815. *Malenotti, Ignazio.*
Il padrone contadino, osservazioni agrario-critiche. Colle. 8vo. fig.
1816. *Finorchi, Anton. Maria.*
Regole teoriche-pratiche e rustico-legali per fare le stime dei predj rustici. Firenze. 8vo.
1816. *Ricci, Jacopo.*
1. Catechismo Agrario. Firenze. 8vo.
2. Del vino, delle sue malattie, e dei suoi rimedj, e dei mezzi per iscoprirne le falsificazioni; dei vini artificiali, e della fabbricazione dell' aceto. 8vo.
1816. *Onorati, Niccolò Columella.*
1. Delle patate, loro coltura, uso economico, e maniera di farne il pane. Milano. 18mo.
2. Saggi di economia campestre e domestica pei dodici mesi dell' anno, ad uso degli agricoltori, dei pastori, e di altra gente industriosa. 18mo.
3. De' Vinaccioli e del modo di estrarne l'olio, e di altri vantaggi che si possono attendere da' medesimi. Napoli, 1818. 8vo.
1817. *Landeschi, ———,* parish priest of Saint Miniato.
Saggio di Agricoltura, con note di Antonio Becchi. Firenze. 8vo. fig.
1818. *Ferrario, G. A.*
L'Agente in Campagna o sia regola sperimentata per migliorare i prodotti di ogni genere d' Agricoltura secondo le terre del regno d' Italia; opera accomodata all' intelligenza de' contadini per loro maggior profitto. Milano. 8vo.
1818. *Gialdi, Giuseppe.*
Lezione premiale d'Agricoltura pratica ragionata. Parma. 8vo.
1818. *Redolfi, Cosimo.*
Memoria sopra un nuovo metodo per ottenere la farina di patate; sull' orzo, sull' acido muriatico, sulle zuppe economiche, e sulla ruggine del grano. Firen. 8vo.

SUBJECT. 4. *Of the Bibliography of the Agriculture of the other Countries of Europe.*

7115. *Germany and Britain* are the only countries in Europe in which it answers to print agricultural books for the sake of the indigenous readers. In Britain education is so general among the middling and lower orders, that reading among them is a necessary convenience of life: in Germany, education and reading are equally general and essential; and consequently in either of these two countries, a book will pay by its sale within the country. But this is not the case in any other European country. In France the mass of the people do not read, but books printed there pay because they are in a language more universal than any other, and perfectly understood by all men of education in Europe. Italian books pay, because they are enquired for by the agriculturists of the south of France, all Spain, and in part of Spanish America.

7116. *Spanish and Portuguese books on agriculture* are in much too limited a demand for production. The earliest Spanish author is Herrera in 1599; and there are scarcely half a dozen since. After the most particular researches of a book agent at Madrid, he was only able to send a list of translations, and the transactions of the Economical Society of Madrid, who have also published Herrera's work with notes within the present century. In 1815, a professor at Madrid published *Lecciones de Agricultura explicadas en el Jardén Botanico*, 2 tomes, 4to. An anonymous author, *Disertaciones sobre varios Plantas Agronomicas*, 1 tom. 4to. Of Portuguese books we could hear of none.

7117. *Of Flemish and Dutch books on agriculture* there are scarcely any. These languages are very limited, and every reader in Holland or Flanders understands French or German. Many works have been published in the low countries in Latin and French, but these cannot be considered indigenous. The few Dutch works on culture belong almost all to gardening, (*Encyc. of Gar.* 7695.) The result of our correspondence with Amsterdam is a *Nieuwe Naamlijst van Bocken*, &c., from which we see little worth taking. There are several translations from British works on culture, and French veterinary books, and the following seem the latest on husbandry.

Magazijn van Vaderlandschen Landbouw, door J. Kops, Commissaris tot den Landbouw, 6 deelen compleet met register.

Aanwijzing ter verbetering van de Akkerbouw en Landhuisbouwkunde, in de Nederlanden, door Professor A. Bruchhausen, in 2 deelen.

De Boeren Goudmijn, of kunst, om van verschillende soorten van Landerijen, het meeste nut te trekken, meer Vee te kunnen houden, en andere Wetenswaardigheden tot den Landbouw, door J. F. Serurier en J. Kops, met platen.

7118. *Of Swedish and Danish books on agriculture*, there are necessarily very few; these languages being of very limited use, and the mass of the people too poor to be able to afford to read about ordinary matters, or what they consider as already well known to them. The time such a people give to reading will be devoted to religious subjects, heroic and romantic poetry, or history. The universities of

Stockholm and Upsal every one knows has produced some useful naturalists; some of these have written tracts on agricultural improvements, especially on planting fruit trees (*Frucht-Träd*) and cultivating culinary vegetables (*Köcks-och Krydd*). A few of such works we have enumerated in our Bibliography of Gardening (7696), but we can scarcely find any fit to be inserted here as agricultural. *The Natural and Chemical Elements of Agriculture*, by Count Gustavus Adolphus Gyllenborg, a learned Swedish statesman, were translated by John Mills in 1770, and may be considered as the prototype of Davy's *Agricultural Chemistry*.

7119. *Of Polish and Russian books on agriculture* it may be easily conceived there are very few. Some translations from French works were made into the Polish language under Fred. Augustus II.; but few or none since that time; the German or French being universally understood by the reading class. Books of agriculture in the Russian language could be of little use. The only things printed in that way there are in the transactions of the Economical Society of Petersburg, for foreigners resident there, and in Latin or German. The best informed Russian nobles read French or German like the Poles. There is an agricultural society at Warsaw, who occasionally print their transactions.

SUBJECT. 5. *Agricultural Bibliography of North America.*

7120. There are a few American books of agriculture, and republications there of most of our best works on the subject. Dean's *New England Farmer's Dictionary*, and Dwight's *Travels*, may be considered as giving an idea of the husbandry of that part of the country; and Roughley's *Jamaica Planter*, of the agriculture of the West India Islands. A number of interesting papers on the subject will be found in the transactions of the American, New York, Philadelphia, and other societies.

1744. *Bartram, John, M.D.*, Philadelphia.
On the Salt Marsh Mussel: On Oyster Banks and the Fresh Water Mussel of Pennsylvania. (*Phil. Trans. Atr. ix. p. 70*.)

1754. *Fleming, or Fleming, Malcolm, M.D.*, of Brigg.

A Proposal in order to demonstrate the Progress of the Dis-temper among Horned Cattle: supported by Facts. York, 8vo.

1755. *Belgrove, William.*
A Treatise upon Husbandry and Planting. Boston, New England, 4to.

1764. *Ellis.*
Essays upon the Husbandry in New England. Lond. 4to.

1779. *Carter, Jonathan, Esq.*, born in America in 1732; died at London 1780, in great poverty.

A Treatise on the Culture of the Tobacco Plant, with the Manner in which it is usually cured, adapted to Northern Climates, and designed for the Use of Landholders of Great Britain, with two Plates of the Plant and its Flowers. Lond. 8vo.

1789. *Antill, Hon. Edward, Esq.*, of New Jersey.

1. An Essay on the Cultivation of the Vine, and the Making and Preserving of Wine, suited to the different Climates of North America. (*Americ. Trans. i. 181*.)

2. The Method of curing Flax; and Observations on the raising and dressing of Hemp. (*ib. i. 266*.)

1789. *Bartram, Moses.*
Observations on the Native Silk Worms of North America. (*American Trans. i. 304*.)

1789. *Carter, Landon*, of Sabine Hall, Virginia.

Observations concerning the Fly-weevil that destroys the Wheat; with some useful Discoveries and Conclusions. (*Trans. Americ. Soc. i. 274*.)

1790. *Dean, Dr.*
New England Farmer's Dictionary.

1800. *Destère.*
La Science du Cultivateur Américain: Ouvrage destiné aux Colons et aux Commerçans. 8vo.

1801. *Bordley, J. E.*
Essays and Notes on Husbandry and Rural Affairs. Philadelphia, 8vo.

1812. *Barton, Benjamin Smith, M.D.*, professor of natural history and botany in the university of Philadelphia.

On the Native Country of the Solanum Tuberosum, or Potatoes. (*Nic. Jour. xxxi. 290*.)

1823. *Roughley, Thomas*, nearly twenty years a sugar planter in Jamaica.

The Jamaica Planter's Guide; or, a System for Planting and Managing a Sugar Estate, or other Plantations in that Island, and throughout the British West Indies in general. Illustrated with interesting Anecdotes. 8vo.

Higgins, Jesse, of Delaware.
A Method of Draining Ponds in Level Grounds. (*Trans. Americ. Soc. vol. 3. p. 323*.)

Greenway, Dr. James, of Dinwiddle County, in Virginia.

Of the Beneficial Effects of the Cassia Chamocrista, in recruiting worn-out Lands, and enriching such as are naturally Poor. (*Trans. Americ. Soc. iii. p. 226*.)

CHAP. V.

Of the Professional Police and Public Laws relative to Agriculturists and Agriculture.

7121. *By Professional Police*, we mean those associations which agriculturists have formed at different times and in different manners for mutual benefit or instruction; and also those institutions for the same purpose established by the legislature, or of such a nature as to be considered public, or national: by laws we allude to those special legislative enactments which affect more particularly agriculture; these are so numerous that we must refer the reader to his lawyer or law dictionary.

7122. There are few or no agricultural lodges, of the nature of those of masonry or gardening. In Scotland it would appear something of this kind had existed among ploughmen at one time, as the passwords and initial ceremonies are talked of in some of the counties by old men. In Forfar, Kincardine, Banff, &c. it is not uncommon for ploughmen, as well as various descriptions of operatives, to belong to gardener's lodges. In the southern districts where sheep farming is followed, there are some shepherd's societies for mutual interchange of experience, and aid in case of losses of such sheep as are the shepherd's perquisite: there are some ploughmen's clubs in different places, and various associations among them of the nature of benefit societies, but these do not come under the description of professional.

7123. *Agricultural societies* for interchange of knowledge are of modern date, but they have increased rapidly since 1794: the number at present or lately existing in the British isles, is at least equal to the number of the counties. Societies of this description

are either general, as the board of agriculture and society of arts; national, as the Highland society and Dublin institution; particular, as the Bath and West of England society; provincial, as county societies; and parochial, as being limited to a few individuals within one parish; of this kind are farmer's clubs, ploughing societies, &c. In regard to the end in view, these societies either embrace the arts in general, the rural arts in general, or some branch of the rural art, as agriculture; or some department in that branch, as live stock, sheep, wool, &c.

7124. All these societies hold meetings at stated periods; most of them offer premiums for particular objects, — specimens of vegetable or animal culture or produce — agricultural operations, — moral and professional merits, as servants, &c.; some of them form a library and museum of models or full sized implements — a few publish transactions, and one or two, as the Dublin society, send out itinerant ploughmen and agricultural mechanics to instruct practical farmers. These societies are almost wholly supported, and the fund for premiums raised by the subscriptions of members, and by voluntary donations, legacies, &c.; but some, as the board of agriculture and the Dublin society, have received assistance from government.

7125. *Of English agricultural societies* the oldest is the society of arts founded in 1754, by Lord Folkstone, Lord Romney, Dr. Hales, and Shepley. They have published many volumes of transactions, awarded immense sums in premiums, and, on the whole, done much good. (See *Rees's Cyc. art. Society.*)

7126. *The Bath and West of England society* was founded in 1777, for purposes similar to those of the London society of arts: they have published some valuable volumes of transactions, and distributed various rewards, &c. (*Rees's Cyc. &c.*)

7127. *The board of agriculture* was founded under the authority of government about 1793; much was expected from this board, but, excepting the publication of the county reports, and the general attention which it called to agriculture, it may well be asked what advantages arose from it. Their *Communications*, in several quarto volumes, contain fewer valuable papers in proportion to their total number than either the London society of arts, or the Bath societies publications; in short, it has been ably shewn in *The Farmer's Magazine*, and the article *agriculture* in the supplement to the *Encyc. Brit.*, that the board never directed its efforts in a manner suitable to its powers and consequence; and that instead of discussing modes of culture, its attention ought to have been directed to the removal of the political obstacles to agriculture, and to the eliciting of agricultural talent by honorary rewards, &c. No idea is more erroneous than that of such a board, or any other doing much good by a national "experimental farm." Horticulture is much better adapted for improvement in this way than agriculture, but a few years will shew whether the immense garden of the London Horticultural Society will answer the expectation of the subscribers.

7128. *Of Welsh societies* there are only two or three of inferior note, which have been already noticed in the topography of the country.

7129. *Of Scotch societies* the principal now existing are the Highland society and the Dalkeith farming society.

7130. *The Highland society of Scotland* was established in 1785, to enquire into the state of the Highlands, to consider the means of their improvement, and the preservation of their language; it is chiefly supported by the subscriptions of its members at a guinea each, a year, and a grant of 3000*l.* from government, soon after its establishment. It has published 5 vols. of prize essays and papers, and now extends its prizes to all the low counties of Scotland. (*Farm. Mag.* vol. 16—316.)

7131. *Of Irish societies* the principal are the Dublin society and the Cork institution.

7132. *The Dublin society* was established in 1731, and incorporated in 1749. Arthur Young observes, that it was the parent of all the similar societies now existing in Europe; but the Edinburgh agricultural society, as we have seen, (775. and 801.) was established nearly ten years before. The Dublin society, in its present advanced state, is one of the most complete establishments of the kind that exists. (*Rees's Cyc. art. Dublin.*)

7133. *The farming society of Ireland* was established under the patronage of the Dublin society in 1800. The object is to improve the agriculture and live stock of the kingdom. (*Archer's Dublin*, 160.)

7134. *The Cork institution*, for applying science to the common purposes of life, originated in private subscriptions about the beginning of the present century; it has since been incorporated, and received the assistance of government, has a house, large botanic garden, and under its auspices are delivered lectures on chemistry, botany, agriculture, &c.; it is not, however, in a flourishing state, and has never been of much use.

7135. The principal county societies in the three kingdoms have been noticed in the topography of agriculture: many of them were established several years before the board of agriculture.

7136. The only other institutions for the improvement of agriculturists and agriculture are public professorships: of these there is one in the university of Edinburgh, established

in 1795; one in Dublin, supported by the Dublin society; one in Cork, and one is destined to be established at some future period in Oxford, agreeably to the will and donation of Dr. Sibthorpe (7004.), professor of botany there.

BOOK II.

OF THE FUTURE PROGRESS OF AGRICULTURE IN BRITAIN.

7137. *The improvement of agriculture*, like that of every art, manufacture, or commodity, necessarily depends on demand and production: a powerful or effectual demand will ensure produce, and excellent produce will, to a certain extent, create demand. A general nicety of taste in coach or saddle horses will call forth a superior description of these animals, and superior animals will tempt purchasers; if the inhabitants of any district who live chiefly on barley or oats, indicate a preference for wheat, and a willingness to pay for that grain, wheat will be produced, and so on. Again, as the object of every individual who engages in art or trade, is to acquire gain, the advancement of an art will depend mainly on the profits it affords; an art or occupation which affords less than the average profits on capital, will only be followed by such as, from habit or other reasons, cannot apply themselves to any thing better, but extra profits will command both capital and skill. From these considerations it is obvious that the improvement of agriculture depends on the profits on capital employed in it, on the taste of those who purchase its products, and on the knowledge of those who are engaged in agriculture as a profession. The first subject would lead us further into political economy than would be of much use in a work of this kind, and therefore we shall limit ourselves to a few remarks on the other topics.

CHAP. I.

Of the Improvement of Agriculture by refining the Taste of the Purchasers of its Products, and increasing the Knowledge of Agricultural Patrons.

7138. *The desire of being comfortable* is the first step towards improvement; but before any thing can be desired, we must know what it is. Men rest satisfied with what they have when they know of nothing better, and therefore one of the main sources of improving the taste both of those who purchase agricultural produce from necessity, and those patrons of agriculture who purchase jointly from necessity and choice, is the increase of knowledge. Could a taste for wheaten bread and butcher meat be introduced generally among the operative classes in Scotland and Ireland, the advantages to agriculture would be immense. Could the same persons be taught to desire a greater degree of cleanliness, light and warmth in their cottages, a greater variety of potherbs, salads, fruits, and flowers in their gardens, and handsome dresses for their wives and daughters; how great the general benefit! Much may be done to bring about this change, by the opulent who are willing to reside on their estates and to take a little trouble. Building good and comfortable cottages, and attaching proper gardens, and stocking them with trees and plants from the demesne garden; offering little premiums, or marks of distinction for keeping them in the nicest order, and for decently clothed, well-bred children, would soon have a sensible effect; attending to that kind of education which consists in teaching infants civility and politeness, with mutual respect and restraint as occasion requires; and teaching grown children how to work at almost every thing likely to come in their way, as is done in the improved German and Swiss schools, would, independently of reading and writing, do a great deal to soften and humanize the peasant mind. Encouragement should be given to save money for unforseen wants, or age; and the certain effects pointed out of early marriages, followed by numerous offspring. These and a variety of similar means would be productive of some change of taste in the operative part of rural society.

7139. *The introduction of manufacturing establishments*, wherever it could be properly done, would contribute to the same effect: those who work at manufactures, and even common mechanics, generally live better, and are better clothed and lodged than the common country laborer; therefore their example would be of use in introducing a salutary degree of luxury. "The endeavoring to impress on the minds of the lower

classes, the propriety of being contented with the simplest and cheapest fare, is extremely pernicious to the best interests of mankind. Encouragements ought not to be bestowed on those who are contented with mere necessities: on the contrary, such indifference ought to be held disgraceful. A taste for the comforts, the enjoyments, and even the luxuries of life, should be as widely diffused as possible, and if possible, interwoven with the national character and prejudices. This, as it appears to us, is the best mode of attempting the amelioration of the condition of the lower classes. Luxuries, and if you will have it so, even wasteful habits, are incomparably better than that cold, sluggish apathy, which would content itself with what can barely continue mere animal existence." "In those countries," Ricardo judiciously observes, "where the laboring classes have the fewest wants, and are contented with the cheapest food, the people are exposed to the greatest vicissitudes and miseries: they have no place of refuge from calamity; they cannot seek safety in a lower station; they are already so low that they can fall no lower. On any deficiency of the chief article of their subsistence, there are few substitutes of which they can avail themselves, and dearth to them is attended with almost all the evils of famine." (*Sup. Encyc. Brit.* art. *Corn Laws*.) Such is the case in Ireland, where amidst the germs of the greatest riches and luxury, the inhabitants are contented to live on less than any other people in the world.

7140. *The taste of the superior patrons of agriculture is to be improved by visiting the best cultivated districts, reading agricultural works, attending agricultural societies, and, above all, by cultivating a farm, and establishing on it a systematic order and regularity in every detail.* Let such observe the hedges, gates, verges of fields, and the beautiful rows of turnips, of Berwickshire or Northumberland; the correctly drilled beans of East Lothian, and the live stock of Leicestershire. But few are the proprietors of lands who either employ a proper bailiff or demesne steward; and of those who do, how few who do not limit and fetter them in their operations, or else neglect them and leave them to sink into that supine state in which the uppermost wish is to enjoy the comforts of the situation with the least possible degree of exertion! Some proprietors desire to have their home farm managed with a view to profit, as the cheapest way of getting hay, straw, mutton, &c.; these are sordid patrons: a home farm ought to combine an elegant orderly style of management, high kept horses, harness, implements, &c., well clothed servants, and every thing in a superior style to what is seen on common farms. Particular attention ought to be paid to the buildings, which ought to combine architectural design, fitness, strength, and elegance; the roads ought to be like approaches to a mansion; the hedges like those of gardens, and the green verges round the fields kept mown like lawns or grass walks, and the ditches, bridges, and gates in corresponding neatness; the finest trees ought to be encouraged in proper situations, and correctly pruned, and substantial watering places formed and kept supplied. Every operation on plants, or the ground, performed in a garden-like manner, and no individual of any species of stock kept, of which a drawing might not be taken and preserved as a beauty. Even the dress and deportment of the servants on such a farm ought to harmonize with the rich culture, orderly display, and high keeping of the whole.

CHAP. II.

On the Improvement of Agriculture by the better Education of those who are engaged in it as a Profession.

7141. *By education is generally understood that portion of knowledge which is obtained at schools; but in a more extended sense (as Mills observes) it may be defined the means which may be employed to render man competent for performing the part which he undertakes to perform in life with increased satisfaction to himself and others. Education may thus be considered as extending to every thing which operates on the body or mind, from the earliest periods of our existence to the final extinction of life. It is unnecessary here to embrace the subject in its full extent, but we shall offer some remarks on the education of practical men in general, on the professional education of an agriculturist, and the general conduct and economy of his life.*

SECT. I. *On the Degree of Knowledge which may be attained by Practical Men, and on the general Powers of the human Mind as to Attainments.*

7142. *The knowledge of languages, history, geography, arts, sciences, and literature, which an agriculturist, whether a ploughman, shepherd, bailiff, steward, or rent-paying*

farmer, daily occupied with his' profession, may acquire, provided he begins at the earliest moment, say at fifteen years of age, and continues to employ his leisure hours in reading till he is twenty or twenty-five, is by no means inconsiderable; not that he can or need become learned; but, if desirous, he may become generally intelligent, render himself fit, as far as conversation is concerned, for good society, prove instructive and entertaining to others by his conversation, and provide a reserve fund of enjoyment, by laying up a store of ideas for reflection in misfortune, disease, or old age.

7143. *The utility of knowledge* to that part of mankind who are doomed to a life of mechanical labor, or rather who suffer themselves to be doomed to it, has been questioned; it is said to render them dissatisfied with their condition, to produce various other evils, and at all events in no way to add to their happiness or the good of society. To a man whose business in life is the mere mechanical performance of operations which any other animal might perform if furnished with hands, education is doubtless less necessary, than to a man whose business is to direct the operations of others; but it does not follow, that though less necessary, it may not be highly useful: if, for example, it renders him dissatisfied with his condition, it will, at the same time, be more likely than any thing else to lead him to some proper mode of improving it; or if almost unimprovable, education certainly will be more likely than a state of ignorance to teach patience and submission, by enabling him to reflect on the folly of grieving at what is inevitable, and the consequences of committing what is unjust or criminal to relieve himself. "The low Irish," Marahal remarks, "are sufficiently dissatisfied with their condition; those who know how to alleviate it by emigration, go to Britain or America; those who know nothing, stay at home, commit acts of violence, and are hanged."

7144. *To decide as to the utility of knowledge to the operative parts of society* would perhaps require a previous decision of the question, "what constitutes happiness?" The general answer is, the exercise of all our faculties of body and mind: every one who has lived thirty or forty years in the world, knows that there is no such thing as absolute happiness: the prince de Ligne, a man of great natural parts, with every advantage of person, birth, and wealth, and in favor at all the courts of Europe; fond alike of war, literature, gallantry, and agriculture, and who lived to be upwards of 90 years of age, has left on record that he was only perfectly happy two or three times in his life, and only for a few minutes each time. Forsyth (*Principles of Moral Science*, vol. i. chap. 1.) says, happiness is a thing not to be thought of, and all that men and women can do in order to make the most of their existence, is to occupy themselves and make progress in whatever they engage in; progress in enjoyment, or approximation to happiness may therefore be obtained.

7145. *The utility of knowledge to every human being* is consequently, in our opinion, unquestionable, on the mere principle of adding to enjoyment; nor do we believe that there is more danger from excess of knowledge in any particular class of society, high or low, than there is from excess in their eating or drinking. A number of men possessed of property or power by inheritance, favor, or chance, who are very conscious that they never could have acquired those advantages by the common competition of talent and industry, and who are in fact wrapt up in selfishness, are naturally jealous of the progress of knowledge; their secret maxim is to keep down the lower orders, and to impress on their minds only the duties of loyalty, religion, and, as Vancouver adds, hard work. This monopoly of power and knowledge, however, cannot be maintained for ever, and in every country is found rapidly yielding to the general progress of society. It is only those who have to dread this progress that fear the diffusion of education and liberal principles.

7146. *The terms knowledge and ignorance are entirely relative*: the knowledge of a modern chemist's porter would have subjected him to be hanged and burned in the days of the first popes; and any bricklayer's laborer of the present day who reads the London newspapers, has more correct ideas of the principles of political economy, than nine-tenths of the nobility in Russia and Spain. It is impossible to set limits to the knowledge which may be obtained by those who are destined even to the most severe and constant labor; the intelligence of the miners in Scotland and Sweden may be referred to as proofs. The miners at Leadhills have a regular library and reading society, and the works they make choice of are not only histories, voyages, travels, &c. but even works of taste, such as the British classics, and best novels and romances. The degree to which knowledge will prevail among any class of laboring men, will depend jointly on their own ambition; on the demand for or reputation in which knowledge is held, and on the opportunities of acquiring it. A dull, stupid person, with little native activity, will never desire to know more than what enables him to supply the ordinary wants of life; but where the workmen of any art are required to have technical knowledge of any particular kind, they will be found invariably to possess it. Thus carpenters and masons require some knowledge of the mechanical principles of

architecture, and working engineers of the strength of materials; and these kinds of knowledge are acquired by them without an hour's interruption of their daily labor; on the contrary, the habit of evening study renders them more steady, sober, and industrious than other workmen; than bricklayers and paper hangers, for example, whose employments require much less intellectual skill. If every cook-maid, before she could obtain a first-rate place, were required to be able to read *Apicius Redivivus* in the original tongue, there would be no want of learned cooks; and if no bailiff could obtain a first-rate situation who had not written a thesis in Greek, or who had not made the tour of Europe, there would soon be found abundance of bailiffs so qualified. A Caledonian, when he comes to the low country, soon acquires the English tongue, and if he has been taught latin, thus knows three languages. The servants at the inns on some parts of the continent, frequented by different nations, often acquire a moderate knowledge of three or four languages: a late custom-house officer on the island of Constatd, spoke and wrote ten languages; and the bar-maid at the hotel de Londres, at which we lodged in Moscow, in 1814, could make herself intelligible in Swedish, Russian, Polish, German, French, Italian, and English.

7147. *The certain way of obtaining anything*, is to be impressed with the necessity of possessing it, either to avoid the evil of being without it, to satisfy the desires of others as to ourselves, or our own desires. There is scarcely any thing that a rational man can desire that he may not obtain, by maintaining on his mind a powerful impression of the necessity of obtaining it; pursuing the means of attainment with unceasing perseverance, and keeping alive that enthusiasm and ardor which always accompany powerful desires. All may not acquire by the same degree of labor, the same degree of eminence; but any man by labor may attain a knowledge of all that is already known on any subject, and that degree of knowledge is respectable; what many never attain to, and what few go beyond.

7148. *The grand drawback to every kind of improvement* is, the vulgar and degrading idea that certain things are beyond our reach; whereas the truth is, every thing is attainable by the employment of means; and nothing, not even the knowledge of a common laborer, without it: there are many things, which it is not desirable to wish for, and which are only desired by men of extraordinary minds; but let no man fancy any thing is impossible to him, for this is the bane of all improvement. Let no young ploughman, therefore, who reads this, even if he can but barely read, imagine that he may not become eminent in any of the pursuits of life or departments of knowledge, much less in that of his profession: let him never lose sight of this principle—that to desire and apply is to attain, and that the attainment will be in proportion to the application.

SECT. II. *Of the Professional Education of Agriculturists.*

7149. In order that a *professional man should excel as such*, every other acquirement must be kept subservient to that of his profession. No branch of knowledge should be pursued to any extent that, either of itself, or by the habits of thinking to which it gives rise, tends to divert the mind from the main object of pursuit; something, it is true, is due to relaxation in every species of acquirement; but judicious relaxation only serves to whet the appetite for the vigorous pursuit of the main object. By the professional education of agriculturists, we mean that direction of their faculties by which they will best acquire the science and manual operations of agriculture, and we shall suppose agricultural pupils generally, to have no other scholastic education than some knowledge of reading, writing, and arithmetic.

7150. *All young men who intend embracing agriculture as a profession*, whether as ploughmen, bailiffs, stewards, land valuers, or rent-paying farmers, ought to undergo a course of manual labor for one or more years, in order to acquire the mechanism of all agricultural operations: when the pupil is not destined for any particular county, then he should be sent to a farmer in a district of mixed agriculture; as for example, East Lothian, where he would, if placed in a wheat and bean culture farm, see at no great distance the turnip system and feeding, and a few miles off, the mountain sheep-farming or breeding: when the pupil is intended to be settled in any particular county, he ought to be sent to a county as near as possible of similar soil and climate, where the best practices are in use, as from all the turnip counties, pupils should go to Northumberland or Berwickshire; from the clay counties to East Lothian, or the carse of Gowrie; from a mountainous district to the Cheviot hills, and Tweedale, &c.

7151. *The term of apprenticeship completed*, the future time of the pupil ought to be regulated according to the ultimate object in view: if he is intended as a ploughman, shepherd, or hedger, perhaps to introduce new practices in other counties, he may remain for a year or two longer with other masters in the same district, in order not

merely to acquire but to habituate himself to all the improved operations and practices. If he is intended for a bailiff, then, after having been two years in one character of farm, let him engage himself for a second two years in a district of an opposite or at least of a different character; and for a third two years, on a third character. There are, as already shewn, only three different descriptions of farming in Britain; the bean and clover, or clay land farming, which includes feeding, by soiling; the turnip farming, which includes feeding both by soiling and pasturage; and the hill, or mountain, or pasture farming, which includes all the varieties of breeding. A young man therefore of ordinary intellect, who has worked two years in East Lothian on a clay farm, two years in the lower Berwickshire, or in the low part of Northumberland, and two years on the Northumbrian hills, must have a very competent knowledge of that part of agriculture, known as farming or husbandry.

7152. *The higher branches of agriculture, or what may be called the engineering, valuing, and estate agency departments, can only be completely acquired by first going through the course above described, as suitable for bailiffs and common stewards, and next, placing themselves under an eminent steward, land valuator, drainer, road engineer, irrigator, &c. as the case may be: making choice of a steward who has extensive woods and plantations, and also, if possible, some quarries, fisheries, or even mines under his care, and of a land valuer or drainer in full employment.* When a solid foundation is laid, by a thorough practical knowledge, of all the operations of common agriculture, the higher part is attained with ease, and may be practised with confidence; but, on the contrary, when young men who know nothing of common country work are sent direct from school, or from an attorney's office, to a land steward or agent, in order to acquire the art of managing landed estates, the worst consequences may be dreaded, both to the proprietors and the occupiers of the territory which may be subjected to them. The condition of many estates and tenants, managed by attorneys, may be referred to in proof of our assertion.

7153. *Young men intended as rent-paying farmers, after two years' labor as common servants, should be kept as assistant bailiffs on other farms, till they are at least 25 years of age: no young man, in our opinion, ought to be put in a farm on his own account, or employed as a master bailiff, at an earlier period.*

7154. *In all cases when young men are destined for particular purposes, they should be sent chiefly to particular districts; as for example, young men intended for road-surveyors, to where roads are best managed—drainers to a draining country—embankers to Lincolnshire—warpers to the Humber—irrigators to South Cerney—hedgers to Berwickshire—woodmen and foresters to Dunkeld, or Blair, Athol, &c. It would contribute much to the improvement of agriculture in the backward counties, if landed gentlemen would prevail on their tenants to send their sons as apprentices, or even as ploughmen, or farm laborers, to the improved counties; or where there are lads brought up by the parish, to send them there with a view to their acquiring the use of the improved implements.*

7155. *Whatever be the kind of professional knowledge to be acquired, the means of attainment is the pupil's paying such attention to what he sees and hears as to fix it in his memory. One of the first things, therefore, that a young man should do, is to cultivate the faculty of attention, which he may do every hour of the day, by first looking at an object and then shutting his eyes, and trying whether he recollects its magnitude, form, color, &c.; whether he would know it when he saw it again, and by what special mark or marks he would know it or describe it. When he goes from one part of the farm to another, or is on a walk or journey, let him pay that degree of attention to every thing he sees and hears, which will enable him to give some account of them when returned from his walk or journey; and let him try next day, or some days afterwards, if he can recollect what he had seen then, or at any particular time and place.*

7156. *The attention to be exercised in such a way as to impress the memory, and enable the observer or hearer, not only to recollect objects, but to describe them, must be exercised systematically. A thing or a discourse must be attended to, not only as a whole, but as a composition of parts, and these parts must be considered not only as to their qualities of dimension, color, consistency, &c. but as to their relative situation and position. To be able to give an account of a town or village, for example, the first thing is to get a general idea of the outline of its ground-plan, which may be done by looking from a church tower, or adjoining hill; next, its relative situation to surrounding objects, as what hills, or woods, or waters join it, and in what quarters; next, the direction of the leading street or streets must be noticed; then the intersecting or secondary streets, the principal public buildings, the principal private ones, where the lowest houses and narrowest streets are situated, and what is the character of the greater number of houses composing the whole assemblage.*

7157. *To treasure up in the mind the characteristic marks of particular varieties and subvarieties of stock is a most important part of an agriculturist's professional education.*

To do this effectually, some knowledge of sketching is of great use, and, if possible, ought to be acquired by every person intending to fill the situation of bailiff or steward. The knowledge of soils, plants, and their culture, is a very simple business compared with the knowledge of stock, which is not only of difficult and tedious acquirement but easily forgotten or lost: for one gentleman's bailiff that knows any thing of stock there are at least a score that know nothing.

7158. *In connection with professional studies*, the pupil may find it necessary, if his education has been neglected, to go on at his leisure hours with all the usual branches of education, either assisted by books alone, or by books and the best assistance he can procure. If his school education has extended to arithmetic, mensuration, mathematics, and drawing, he should occupy himself in acquiring a knowledge of botany, zoology, geology, and mineralogy, without a tolerable knowledge of each of which, he will ever be in the dark among modern agriculturists, and in reading books on the subject. Next, let him study the various arts and manufactures that have any relation to agriculture, and store his mind with all he can acquire from one of the best general *Encyclopedias*, as that of Rees, or the *Encyclopædia Britannica*, with its excellent supplementary volumes. If he will go farther, and if he wishes to know the extent to which he may go, he may consult what we have advanced on the subject of education in the *Encyclopædia of Gardening*.

SECT. III. *Of the Conduct and Economy of an Agriculturist's Life.*

7159. *A plan for the general conduct of life* should be fixed on by every one when he arrives at manhood, and steadily pursued for the time to come: most commonly such a plan is formed by the parents soon after the child's birth, and at the latest, when the boy is taken from school. The boy arrived at manhood, however, is entitled to examine this plan, and amend it, or devise another more congenial to his own notions; but the risk of any change of this sort by persons so young and inexperienced is so great, that no youth ought to venture on it without the utmost consideration and the firmest persuasion in his own mind: where the parent has done his duty, such changes of plan will not often be attempted, for, by the early infusion into the mind of a child, ideas of the pursuit that is intended for him, a taste for that pursuit or employment will grow up with him, and become as it were his own natural inclination. This will happen in most cases, but in some children the bias or force of nature for some particular purpose is so strong, that by no parental intreaties or reasoning can it be overcome; even where a sense of duty has induced compliance with a parent's wishes for a time, the dormant inclination has at last broke out and taken the lead. In such cases, the parent may generally conclude, that where the pursuit or purpose is not bad, the force of natural inclination will be more likely to command success than the influence of parental authority, and that a pursuit or business, commonly of little profit or repute, will be more profitable and respectable when followed by a genius powerfully impelled to it, than a profitable and reputable business followed by any one against their inclination.

7160. *The plan and conduct of life is in most cases determined by accidental circumstances.* The son of the laboring man grows up without any regular training or education for a particular end, and finds himself at the age of manhood engaged in rural labor, and apparently incapable of any other; his notions and his ambition are so limited that he dares not venture to desire a change for the better, for no man ever desires that which he thinks impossible to attain, and the mere idea of this impossibility, however erroneous, effectually restrains the attempt at improvement. The life of the ploughman or laborer, much as it differs from that of a man of eminent natural powers and superior education, is capable of much amelioration by being directed to a suitable end or object as the ultimatum, or in other words, by proceeding on a plan; plan indeed, as we have elsewhere observed, (*Encyc. of Gard.* 2nd edit. 778.) is predestination, as conduct is fate.

7161. *The greater part of mankind enter on life without any fixed plan or object in view, or if they form some general notion of acquiring wealth or distinction, they form no plan by which it is to be accomplished; the consequence is, that such persons after blundering on through their best years, arrive at the end without having gained anything but experience, now of no use to them.* No man is born in possession of the art of living, any more than of the art of agriculture; the one requires to be studied as well as the other, and a man can no more expect permanent satisfaction from actions performed at random, than he can expect a good crop from seeds sown without due regard to soil and season: when we look round and observe the quantity of misery in the world, the greater proportion is, or seems to be, the result of a want of plan, or of a bad plan of life: how many parents are unsuccessful in their struggles to maintain a large family, the result of too early marriages: how many find themselves arrive at old age with no other resource for support but charity, the consequence of want of foresight in expenditure: how many are suffering under poverty, brought on by their own want of frugality, or positive extravagance; or under disease from excesses and irregularities committed in the hey-day of life: and how many among those not born to inherit property, who, at no period of their life, have any other alternative between hard labor and deficient food, than disease and want.

7162. *Want of plan may not in every case be the cause of all this misery, because, accident enters into life for something, both in the unfavorable as well as the favorable side of the question; but we have no hesitation in asserting, that want of plan, as a cause of misery, is as ninety-nine to a hundred: any plan at all, even a bad plan, is better than none, because those who set out on any plan will, in all probability, sooner discover its errors, if a bad one, and correct them, than those who set out on no plan, will discover the want of one, and form a good plan.* The young man who is just setting out in life, may well tremble at the consequences of proceeding on the journey without the guide of a judicious plan: this plan he must form himself, because he alone feels what he wants, and what he can do to gratify them;—all that we can do is to offer a few hints.

7163. *In order to be able to form a plan it is previously necessary to determine the object to be attained*

by it : happiness is the object of every action of human life, and consists in the gratification of certain wants and desires ; some of these desiderata are peculiar to youth, and others to old age, but many, as clothing, food, rest, relaxation, entertainment, &c., begin with the earliest, and continue to the latest period of life : all these gratifications are procured by labor ; in savage life, by hunting, fishing, and gathering fruits, till the man, no longer able for these labors, is obliged to lie down and die of want : in civilized society, they are also obtained by labor ; but here, what is called property, exists, and man, in the vigor of his days, when the supplies of his labor are greater than the demands of his wants and desires, or when he chooses not to gratify the latter to the full extent admitted by the former, can, as it were, embody a part of his labor, to be made use of when he is no longer able to perform it with ease : a man in this case is said to arrive at independence, instead of want, as in the case of the savage ; or of beggary, as in the case of the improvident.

7164. *Independence is the grand object which every man destined to live by the exercise of his labor or talents ought to have in view.* At certain periods of life, when the imagination is vivid, and health and spirits in their utmost vigor, some may prefer present enjoyment, mere animal gratifications, or imaginary distinctions, amatory conquests, titles, rank, military glory, high literary or professional reputation : it is a noble attribute of our nature to prefer these to mere accumulation of money ; but a great warrior, poet, or painter, arrived at old age and want, if the latter be brought on by common improvidence, will not find himself surrounded by many marks of distinction ; and though it may possibly be some consolation to him that the three or four letters composing his name, will be sometimes pronounced together after he is dead, yet it will not be much.

7165. *The exercise of his profession is the most rational mode in which an agriculturist, of whatever grade, can pursue independence ; only extraordinary circumstances can justify a change of profession ; in common cases it indicates a want of steadiness of character, or a want of success, and the latter is commonly attributed to want of skill ; it is better, therefore, to pursue unremittingly the profession to which we have been educated, even though we should not be very successful in it, than to risk an infringement on character by adopting another.* The practice of agriculture, as we have already seen, (6925.) is carried on by three different classes, serving, commercial, and artist agriculturists : on each of these classes we submit a few hints to aid them in forming a plan of life, and regulating their expectations.

7166. *The greater number of agriculturists must ever belong to the lower grades of the serving class ; and act as ploughmen, herdsmen, shepherds, hedgers, woodmen, and laborers of all work.* These form the greater proportion of mankind in every civilized country, and must ever remain the bulkiest material in the social fabric. Comparing one age and country with another, however, there may be the greatest difference in their intellectual and physical condition. The ploughman of Russia is but a remove from his horse. The ploughmen in different parts of Britain are as intelligent as their employers : in Scotland they have the Bible by heart, are familiar with the history of their country, and not ignorant of its literature : they lead a laborious life, but they enjoy the inestimable blessings of health, sound sleep, and peace of mind, till the latest period ; they are almost always independent, either from their labor, their savings, or in old age or sickness, from the assistance they receive of their children in return for what was laid out on their education. These men are as happy relatively to their capacity for happiness as any other class whatever ; if their measure is smaller, it is as full as the largest ; for the essential materials of comfort and happiness are the same in all classes, and in all classes a man's wants and wishes accommodate themselves to the means of gratifying them. The rich have no wants, and their desires, for the most part, are no sooner expressed than gratified ; the pains and pleasures of life are neutralized into a kind of insipidity, till ennui brings on disease, which to this class becomes a blessing, by procuring for them the occupation of taking medicine, the duty of attending to the doctor's regulations, and the pleasures of convalescence.

7167. *The plan of life suitable for the operative agriculturist may very well be founded on the condition of this class of men in the northern counties of Northumberland, Berwickshire, East Lothian, and others.* We have already (7048. and 7049.) described the manner in which farm servants are hired, lodged, and paid in these counties : the essence of the mode consists in the employer providing the employed with comfortable cottages and gardens, and paying them chiefly in the necessaries of life, in so much meal or flour, so much ground to grow potatoes, and flax or hemp, a cow's keep, the run of a pig—if a shepherd, so much wool, or so many sheep, the loan of a team to bring home coal or other fuel, and a certain proportion of money. By this mode of payment the operative countryman is always sure of a comfortable home and food, sure of milk, butter, meal, bread, and potatoes, the produce of a pig, poultry, and bees, and of the produce of his garden ; and this, however high may be the prices of these articles in the public market. All country servants hired by the year might be accommodated and paid more or less in this manner ; and to this mode of life and payment they ought to look forward as the ultimatum of their grade in the scale of operative agriculturists. By prudent conduct, in regard to the increase of their family, and by frugality, they may live in decency and comfort, educate one or two children, and save something for old age, or unforeseen occurrences.

7168. *The day laborer who has no particular employer, and probably no fixed residence, is much less comfortable than the yearly servant ; in England more especially, under the present system of poor laws and parish management, which is calculated to degrade him, and effectually to prevent any attempt at improving his condition.* If, as Stacey observes, "by unremitted industry, he has been enabled to do without parochial relief, and bring up his children decently, it is as much as could be expected ; for an attack of illness, or the temporary loss of employment, he is in general totally unprepared ; he thinks not much of the morrow, and, as it stands, it is perhaps well for him that he does not anticipate evils which he cannot prevent : every one knows how beneficial to the community, how advantageous to the indi-

vidual, the hope of bettering his condition in life is: it cheers him in adversity, encourages his industry, promotes his content, yet from this hope the major part of the agricultural laborers of England are excluded; they toil indeed, but it is to continue, not to better their existence." (*Essay on the beneficial direction of rural expenditure*, p. 170; see also the succeeding chapters of these judicious and intelligent essays.)

7169. *The plan of life for the directive class of agriculturists* need hardly be pointed out; the rise from a farm bailiff to a steward's bailiff, or to a demesne bailiff or steward, and thence to the general steward or factor of an estate, is an obvious object of ambition. In another direction he may rise through the different gradations of the commercial agriculturist, or, adopting the rank of counsellor or artist, he may become a salesman, appraiser, timber or land-surveyor, land-valuer, agent, or agricultural engineer: rarely, however, can he attempt the veterinary profession, or those of draftsman, author, or professor.

7170. *The remuneration to which a directive agriculturist is naturally entitled*, should be regulated by his professional abilities and experience; that which he will commonly receive will be regulated by the quantity of agricultural talent and experience in the market; it ought always to be such as will preserve him in a distinct class from the operatives, and render it worth his while to be honest, assiduously attentive to the interest of his employer, and of a polite and obliging manner. A handsome salary to such a servant is wise economy.

7171. *The object of the artist or counsellor agriculturist*, may be either to ascend to the rank of author or professor, conditions of more honor than profit; or to realize property and become a proprietor cultivator. For a rent-paying farmer, no artist or author is at all adapted.

7172. *The legitimate object of a commercial agriculturist* is to rise in the different grades of his class, and become either a large farmer, a gentleman farmer, or, best of all, a yeoman, or proprietor cultivator (*propriétaire cultivateur*).

7173. *The profits to which a commercial agriculturist is entitled*, comparatively to that of other commercial men, are theoretically determinable by the risk attending the employment of his capital, and the skill requisite to prosecute his art; but practically, this remuneration will depend on the quantity of skill and capital in the market. The risk attending capital employed in the culture of the useful products of the soil, is evidently less than the risk of capital employed in many or perhaps most manufactures; and the skill requisite to enable any one to become a farmer, according to the customary practices of the country surrounding him, is less than that required for almost any branch of manufacture. In consequence of these things, there are men every where ready to become farmers; hence the profits of farming are naturally less than those of most other pursuits; but to counterbalance this, the farmer has several advantages peculiar to his profession. First, from the nature of his residence in the country, which assumes a certain degree of consequence, from its connection with a considerable group of out-offices; these, surrounded by a garden, orchard, fields, woods, and other rural scenery, all in his occupation, and inhabited by servants in cottages, horses, cattle, sheep, and other domestic animals, all in subjection to him; all these things give him a degree of consequence both real and apparent, and assimilate him more nearly to a lord of the soil, and to that sort of rural retirement and independence, the object of almost every commercial man's ambition, than any other mode of life short of the thing itself. Secondly, many trades and professions preclude (according to general prejudices) their followers from being gentlemen; whereas, though every farmer is not a gentleman, yet any gentleman may become a farmer, without in any degree lowering his rank and character; a farmer may, therefore, if he chooses to adopt the habits and manners of a gentleman, be reckoned as such. Thirdly, the farmer's products are in universal demand, and he is sure of a market at some reasonable rate, a fact otherwise with many manufactures. Fourthly, he is sure of a home, of the necessities of life, and in general, of most vigorous health. Fifthly, he is generally a man of more parochial influence than the tradesman or manufacturer.

7174. *No farmer ever makes a fortune by his profession*: the utmost exertions of the most skilful and industrious men in the most improved districts, seldom do more than enable them to keep pace with the times; and the great majority, in all countries, lead a life of great labor and anxiety, and end as they began. No farmer, in a general way, can raise more than one corn crop in a year, and in this respect, the farmer of Russia and Poland has the advantage of the British farmer; for the lands of the former being from five to eight months under snow, all root-weeds are destroyed, and the ground so loosened by the frosts and thaws, as to require very little stirring for the seed; the rapid summer which succeeds ripens all annual plants that will grow there, nearly as well as in England, and better than in many parts of Scotland and Ireland. The British farmers, however, have the great advantage of perpetual pastures, owing to the mildness of our winters, but still no art of man will shorten the period of animal gestation, and originate a lamb or a calf in shorter periods than 5 months and 40 weeks. How often does the tradesman or manufacturer turn his capital in that time? There are three varieties of professional farmers, however, which occasionally realize some property; the grazier who feeds with oil cake, grains, and other artificial foods; the dealer in corn or cattle, who has the art to buy at a falling and sell at a rising market; and the dealer or jobber in farms, who sublets or sells his lease, or in purchases of land, who subdivides and sells estates. The profits of the first are not great, and those of the two last are attended with great risk: the only farmer whose lot is to be envied, lives under a landlord who does not take the full marketable price for his lands: such as Burdet, Coke, Bedford, Northumberland, and many others in the south, but few in the north or the west.

KALENDARIAL INDEX.

THOUGH agricultural operations, in general, require less nicety as to the exact time of performing them than many of those of gardening, yet there are exceptions in respect to some field crops; for example, beans and turnips. It is proper to observe, therefore, that the *almanac time* in this kalendar is calculated for the meridian of London; but as a *kalendar of nature* is given for the metropolitan district, the almanac time may, in every part of the empire, be varied to suit the local climate and vegetation.

In general, other circumstances being alike, four days may be allowed for every degree, or every 70 miles north or south of London; in spring, operations may be commenced earlier in that proportion southwards, and later northwards; but in autumn the reverse, and operations deferred as we advance southwards, and accelerated as we proceed to the north. In every case allowing a due weight to local circumstances.

Our notices under each month extend only to a few of the leading features of country-work; — to attempt to insert every thing, or even most of the things that require attending to, we conceive impossible; and, if it could be done, quite useless. A man will always act better when guided by his own judgment, than when following implicitly that of another. Kalendars should only be considered as remembrancers, never as directories.

JANUARY.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London -	35 9	6	29 46	1.957 inch.	A cold January is reckoned seasonable; the air being drier during a low state of the thermometer than when it is a little above or below the freezing point; winter-cold is generally less felt by animals than that of March. Winds often prevail during this month. The kalendar of animated nature is much more to be depended on than the vegetable kalendar; for, excepting the catkins on trees, the state of the other plants during this month depends much on the character of the preceding autumn.
Edinburgh	34 5		29 194	2.994	
Dublin -	39 92	2.	29 721	2.697	

1. Kalendar of Animated Nature round London.

In the first week: shelled snails (*adula*), and earth-worms (*umbricus terrestris*) appear.

Second week: redbreast (*motacilla rubicola*) whistles, nut-hatch (*alitta europæa*) chatters, mixed thrush (*ardus viciatoris*) sings, and wagtails (*motacilla alba et flavus*) appear.

Third week: the common lark (*alauda arvensis*) congregates.

Fourth week: snails (*helix hortensis*) and slugs (*limax ater et agestinus*) abound in sheltered parts of gardens; the hedge sparrow (*motacilla modularis*) whistles, the large titmouse (*parus major*) sings, and flies appear on windows.

2. Kalendar of Vegetable Nature round London.

In the first week: some plants accidentally in flower; and others, as the laurestinus, continued from December.

Second week: winter aconite (*ranunculus hyemalis*), Christmas-rose (*holcorus fatidifolius*) in flower, and hazel (*corulus avellana*) catkins beginning to appear: common honeysuckle (*lonicera periclymenum*) buds begin to appear.

Third week: primrose (*primula vulgaris*) flowers in sheltered places; daisy (*bellis perennis*), and chickweed (*aletris media*) begin to flower.

Fourth week: meadow-sweet (*claytonia mezerion*) begins to flower; and sometimes spurry (*eryngium arvense*), pansy (*viola tricolor*), white scented violet (*viola odorata*), archangel (*lunaria rebus*), and coltsfoot (*tsusagula purpurea et odorata*) show blossoms.

3. Farm-yard. (2740.)

Attend to cattle, whether in the open yard on straw and a few turnips, (4898.) in hammels for feeding, (6177.) or in stalls, (6174.) See that the weak are not driven from their proper share of green food by the strong; notice any in bad condition, and put them in a place by themselves for a few weeks. When the hay or straw is of inferior quality or flavor, sprinkle with salt water, which will make it more palatable.

Threshing (2961.) goes on pretty regularly at this season for the sake of a supply of straw. In some districts it is common to thresh an hour every morning with candle-light during the three winter months, the candles being hung up in lanterns; so that the gudgeons and other places are kept dried, and the teeth of wheels grained or soaped, or coated with anti-attrition.

Implement not now in use may be repaired, also harness greased, ropes spliced, and various evening jobs executed, where it is customary to work a part of the winter evenings.

Men's lodges. (3856.) In some districts the unmarried farm-servants have a common living room in the farmery, with a sleeping-room over, or sleeping-rooms over the horses. It is the duty of the farmer or bailiff to see that these young men are properly occupied during the long winter evenings. A portion of every man's time will be taken up in mending his clothes or shoes, and sometimes in oiling and cleansing horse harness: the rest they ought to be encouraged to pass in reading, or otherwise instructing themselves. One may read aloud to the rest; one may instruct the others on any subject; a

master may be got in for an hour or two every evening, who would teach them all. A master suitable for this purpose will often be found among the married servants, or among the village mechanics. To serious studies may be joined recreative ones, such as the flute, violin, story-telling, singing, speech-making, dramatic attempts, &c. The bailiff or farmer should occasionally come and examine each lad, and bestow some mark of approbation on the most deserving.

4. Live Stock. (5546.)

Store farms (6451.) whether of sheep or cattle, require considerable attention during the winter and spring months to supply straw and hay, with such green food as can be spared, to stock on scanty pastures; and to shelter during storms, especially of snow.

Lambs are dropped during this month by the Dorset sheep, and near London are generally kept in the house and fed. (6485.)

Calves, fattening at this season (6167.) should be kept very clean, and their supplies of milk liberal. Calves to be reared as stock should never be dropped sooner than April.

Pigs (6538.), poultry (6680.), and stock in general, should be kept in good heart at this season, otherwise in the spring months they will be fit for nothing, and half the summer will elapse before they recover the bad effects of winter starvation.

Fish, when the ponds are covered with ice, require attention, to break holes to admit air. (6800.)

Bees if dormant do not require to be fed; but if the weather is so mild, or they are placed in so warm a situation as to occasion their flying about, they should be examined, to ascertain if feeding be requisite. (6827.)

5. Grass Lands. (5086.)

Dry soils and uplands should alone be stocked with cattle or young horses at this season. (5257.) Sheep should not be allowed to graze either on wet marshy meadows or on young clover. (5005.) Grass lands, under a system of irrigation, may now be kept covered. (4058.) Clayey soils and others not properly drained should now have that operation effectually performed on the surface (3973.) or under it (3961.), according to circumstances.

Worms (6921.) on some soils do considerable injury to grass. Where the labor is not considered too tedious, and there is a water barrel at any rate, they may be killed by mixing powder of lime with the water, at the rate of one pint to ten gallons. On lawns, and in small paddocks, or in the care of *Ferme ornée* getting rid of worm casts is an object worth attending to, and this month, February, and October, are the best seasons for the operation.

6. Arable Lands. (4548.)

Plough when the soil is not too wet. Lead out dung and farm field dunghills, also compost heaps, with peat or other materials. See that drains, ditches, and water-furrows run free, and answer their respective ends.

Bees (4784.) are in some dry situations planted in the last week of the month; and also pease, and sometimes oats, are sown. On the whole, however, it is better to defer the beans and pease till the first and second weeks of February, and the oats till the two last weeks of that month.

Spring wheat of the common kind (4622.) may be sown where the soil is suitable.

7. Fences (3767.), Roads (3280.), and Drains. (3809.)

Heathworts may be planted in fence-lines, in any of the different modes. (3780.) Ditches, walls, palings, and all other fences of the common kind may be formed; but some where hedges or other evergreens are to be used. Repair by the different modes. (3794.) Roads and drains may be formed at all times and seasons.

8. Orchards (3770.) and Hop-grounds. (5393.)

Prune trees and free them of moss. Where digging round each tree is practised, this is a good season. Stake and the newly planted trees. Plant orchards. Trench ground for hop plantations. (3400.)

9. Wood Lands and Plantations. (3627.)

Prepare the soil for planting. Plant deciduous hard wooded trees in mild weather. Plant and sow the larger tree seeds, whether in places where they are finally to remain, or in nursery grounds.

Fell timber and coppice not valuable on account of its bark. Stock up roots, stack them, and char them.

Prune deciduous trees; fill up vacancies. Cut *heathworts* hedges. (3790.) Gather any tree seeds not before gathered.

Drain wood-lands and cut paths or other openings required through them, the leaves being now off the deciduous sorts.

FEBRUARY.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London	42 5	5	29 94	0.675 inch.	This month (the <i>spring</i> or <i>spring</i> into month of the Saxons) is usually subject to much rain, or snow; either in accounted seasons: the old proverb being, "February fill dikes with either black or white." Round London, the sap in vegetables shows evident symptoms of action about the middle of the month, and sometimes a week earlier. The animal kingdom, and infestation of native trees for this month will generally be found very correct.
Edinburgh	36 6		29 566	1.269	
Dublin	45 78		30 091	2.21	

1. Kalendar of Animated Nature round London.

In the first week: bees (*apis mellifera*) come out of their hives, gnats (*culex*) play about insects (*insecta*) swarm under sunny hedges, and the earth-worm (*lumbricus terrestris*) lies out; hen-chaffinches (*fringilla*) flock, and the song-thrush, or thrush (*turdus musicus*), and common lark (*aldada arvensis*) sing.

Second week: the buntlings (*emberiza alba*), and linnets (*fringilla linata*), appear in flocks; sheep (*ovis aries*) drop their lambs; geese (*anser anser*) begin to lay.

Third week: rooks (*corvus frugilegus*) begin to pair, and resort to their nest-trees; house-sparrows (*fringilla domestica*) chirp, and begin to build; the chaffinch (*fringilla caesia*) sings.

Fourth week: the partridge (*tetrao perdix*) begins to pair, the blackbird (*turdus merula*) whistles, and the wood-lark (*aldada arvensis et arborea*) sings; the hen (*phasianus gallus*) sits.

2. Kalendar of Vegetable Nature round London.

In the first week: the snowdrop (*galanthus nivalis*), whin (*ulce europaea*), white deadnettle (*lamium album*), polyanthus (*primula veris*) flowers; and the elder (*sambucus nigra*), and some roses and honeysuckles begin to expand their leaves.

Second week: common crowfoot (*rannunculus repens*), dandelion (*taraxacum*), and the female flowers of hazel (*corylus avellana*) appear.

Third week: veronica agrestis in flower; many of the poplar and willow tribe show their catkins; and also the yew (*taxus baccata*), alder (*alnus communis*), the tulip (*tulipa*), crown imperial (*fridularia imperialis*), and various other bulbs, boldly emerging from the ground.

Fourth week: the erica carnea, wood strawberry (*fragaria vesca*), some speedwells (*veronica*), the groundsel, and sometimes the stocks and wall-flower (*cheiranthus*) in flower. Some sorts of gooseberries, apricots, and peaches, beginning to open their buds.

3. Farm Yard. (2740.)

See last month. In taking in stacks to thresh, destroy vermin as much as possible (6855.). Clear away the bottoming of straw, faggots, or other temporary matter, and leave the site perfectly neat and clean: the poultry will pick up what grains may have dropped. Be vigilant in keeping stock of every description in order; wintering cattle by frequent supplies of fresh straw and turnips, or other roots; horses by sound corn, and good pease-straw, or clover-hay, dispensing as much as possible with wheat and oat straw. The evening food should, occasionally at least, be of carrots or potatoes.

Poultry now lay freely, and if some indicate a desire to incubate, so much the better where an early brood is an object. Men's lodge. There are still a good many hours for mental improvement.

4. Live Stock. (5546.)

Sheep generally begin to lamb during this month, and require unremitting attention from the shepherd. (6381.) At-

tend to feeding lambs as before (6433.), and to milch cows (6183.) and fattening calves (6167.)

5. Grass Lands. (5086.)

See last month. Manures, where applied to grass lands, may be laid on at this season; and such old mossy lands as are to be broken up, may now be pared with a view to burning next month.

The watering of meadows in warm situations may be partially left off towards the middle of the month, to encourage the growth of the grass. (4056.)

6. Arable Lands. (4548.)

Beans should be put in during this month. (4764.) Pease for podding, and for a ripened crop may be sown at different periods (4759.), and tares for soiling or seed. (4735.) Oats sown from the middle of this month to the middle of March (4694.), unless on very old turf, where they may be sown later. It is a common, but erroneous opinion, that old grass lands intended to be broken up and sown with oats or beans, should be ploughed as early as possible, so as the frost may have some effect on the furrow before seed time. But this, though most plausible, is most dangerous doctrine, it being found from experience, that lands so ploughed and sown, are always more subject to have the plant of corn destroyed by the grub, wire worm, or other larvae. The only safe mode with such lands, is not to plough them till about the middle of March, and then to plough, sow, and roll immediately afterwards. It would appear that by this practice the larvae of insects are buried so deep, that they have not time to reach the surface before the grain has germinated and grown out of the reach of their attacks, or possibly they may be so deeply buried as to be obliged to remain another season under ground; it being known to naturalists, that the eggs, larvae, and chrysalides of many insects, like the seeds of many plants, will, when buried too deep, or otherwise placed in circumstances not favorable for their immediate hatching or germination, remain there, retaining their principle of life till they can make their way, or are by accident placed in circumstances favorable for their development. The safest plan, however, to break up old grass land, is to pare and burn. (5278.)

Spring wheat of the common kind may now be advantageously sown (4605.), and barley is also sown in some warm spots in the last week of the month.

7. Fences (3809.), Roads (3280.), Drains, Ditches (2767.), Ponds (4130.)

Hedges may be planted (2755.), grown ones pruned (2788.), old ones plashed or cut down (2794.), and imperfect ones repaired. Walls built (2851.), water fences, and ponds ferned (4130.).

8. Orchards (3770.) and Hop-grounds (5393.)

See last month.

9. Wood Lands and Plantations. (3627.)

As in last month. Where there is a nursery store, nut and kernel tree seeds may now be sown.

MARCH.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London	46 4	4	30 30	0.716 inch.	The beginning of March usually concludes the winter; and the end of the month is generally indicative of the succeeding spring; according to the proverb, "March comes in like a lion, and goes out like a lamb." The seasons called this month the <i>lengthening month</i> , in allusion to the increasing of the days. This is a laborious and trying month, both for men and cattle engaged in field operations.
Edinburgh	44 7		28 886	1.455	
Dublin	44 09		29 707	2.364	

1. Kalendar of Animated Nature round London.

In the first week: the ring-dove (*columba palumbus*) coos; the white wagtail (*motacilla alba*) sings, and the yellow wagtail (*motacilla flava*) appears. The earth-worm (*lumbricus terrestris*), and the snail (*limax*), and slug (*limax*), engender.

Second week: the jackdaw (*corvus monedula*) begins to come

to churches; the tom tit (*parus ceruleus*) makes its spring note; brown wood-crow (*strix alba*) hoot; and the small tortoiseshell butterfly (*papilio urticae*, L.) appears.

Third week: the marsh titmouse (*parus caeruleus*) begins its notes. Various flies (*musca*) appear. The fox (*canis vulpes*) smells rank. The turkey-cock (*meleagris gallopavo*) struts and gobbles.

Fourth week: the yellow hammer (*embarus chrysillus*) and green wood-pecker (*parus viridis*) sing; rooks, ravens (*corvus*), and house-sparrows (*passer*) build; the goldfinch (*fringilla caerulea*) sings. Field-crickets (*scaphium*) open their holes; and the common flea (*pulex irritans*) appears.

2. Kalendar of Vegetable Nature round London.

In the first week: various species of the pine, larch, and fir tribe in full flower; the rosemary (*rosmarinus officinalis*), the willow (*salix*) and bay (*laurea nobilis*) in blossom; various trees and shrubs beginning to open their buds.

Second week: the common honeysuckle (*lonicea periclymenum*), and some roses in leaf; crocus (*vernus*), and other species, and some scillas in flower. Pilewort (*portula*), and creeping crowfoot (*ranunculus repens*), hepatica, and elder (*sambucus nigra*), sometimes in leaf.

Third week: saxifraga oppositifolia, draba verna, daphne pontica, and collina; and lonicea nigra, in flower.

Fourth week: the peach, nectarine, apricot, borchyrus japonicus, pyrus, japonica, crown imperial, saxifraga cernuola, borus sempervirens, and other plants, in warm situations, in flower, or just advancing to that state.

3. Farm Yard. (2740.)

Wintering cattle should be liberally supplied with food from this time, till they can be wholly turned to grass: as straw and hay gets drier at this season, more should be given, and the supply of turnips, or other roots, rather increased than diminished. Where oil cake, brewers' grains, and similar articles can be obtained, they are valuable auxiliaries. Fattening cattle (6183.) and milch cows (6174.) require continued attention to food, cleanliness, and moderate exercise. Working horses must be kept in good condition; if they fall off now, they will not recover themselves for several months. Potatoes may now be cut into sets, preparatory for next month.

4. Live Stock. (5546.)

Sheep now drop their lambs freely; and none pay better than such as are turned off at this time, and finished off in April, on forward pasture. As turnips begin to run to flower about this time, they are apt to prove more than usually laxative, and therefore the stock supplied with them should have an extra supply of hay.

5. Grass Lands (5086.)

Meadows intended for mowing (5197.) should now be shut up, their surface having been freed from stones or other extraneous matters, the furrows or water gutters made completely effective, and if the weather will permit, the surface bush-barred and rolled. Meadows, which have been flooded during winter will, in favorable situations, show a considerable crop of grass by the beginning of this month. Turn off the water a week or ten days, till the surface gets firm: then feed with ewes and lambs, giving a little hay in the evening. Calves may also be turned on these meadows, but nothing heavier. The best mode is to hurdle off the grass in strips, in the manner of eating turnips or clover in the places of their growth. Mules (5692.) and worms (5854.) are best destroyed at this season.

6. Arable Lands. (4548.)

There are few hardy seeds, whether of agriculture or gardening, that may not be committed to the soil during this month. Spring wheat of the common kind (4603.) may still be sown; but if possible, not later than the middle of the month, or its

(4603.), rye (4694.), barley (4659.), canary corn (5485.), buck wheat (5490.), beans (4764.), pease, tares, &c.

Clover and rye grass (4985.) may now be sown among young wheats after naked fallows, or among spring corn in lands in good heart and fine till.

Field beet (4926.), carrots (4962.), parsneps (4951.), and Swedish turnips should be sown the last fortnight of the month, provided the land is dry enough to be sufficiently cleaned, and pulverized to the depth of at least a foot. It more frequently happens that this cannot be got done till the beginning of April, and hence this class of seeds are seldom got in before the middle of that month. The carrots should be first sown, and the Swedish turnip will bear to be the latest. Lands intended for potatoes, cabbages, turnips, transplanted Swedish turnip, and other plants of the Brassica kind should be brought forward by such ploughings, cross ploughings, and workings with the grubber, as their nature and state may require. It is one great advantage of the common white turnip, that it admits of two months more time for preparing the soil than other root or Brassica crops. Summer or wheat fallows require at least one furrow in course of the month.

7. Fences (2761.), Roads (3280.), and Drains (3809.)

Thorns and other hedge plants may be put in, but the earlier in the month the business is completed the better. This is an excellent season for making or repairing roads (3475.), drains, ponds, embankments, &c. the ground being still moist, and the days sufficiently long to admit of a man's laboring ten hours, or from six to ten in January, the ground is often too wet, or frozen, or covered with snow, and the days too short for advantageous day labor. In July and August the ground is too dry and hard for spade work, and day labor high on account of the proximity of hay time and harvest.

8. Orchards (3770.) and Hop-grounds. (5393.)

Finish pruning fruit-trees (3798.), and also digging round their stems, if that is practiced. (3804.) Where young orchards are grazed, see that the guards or fences to the single trees are in repair.

Form plantations of hops (5393.), and open up and dress the hills of established plants, returning the mould to their roots. (5416.)

9. Wood Lands and Plantations. (3627.)

In the tree nursery, finish sowing acorns, keys, nuts, mast, berries, stones. Sow also the lighter trees, as poplar seed (where it can be got), willow, birch, alder, elm, &c. Transplant from the seed bed, or from nursery to broader intervals, and attend to other parts of the usual routine culture.

New plantations may still be planted, endeavoring if possible to finish putting in deciduous trees with the month; using the puddle in dry weather (5666.), and fixing by water (5667.) Where large trees are introduced, the latter generally require to be staked.

Evergreens of the harder kinds, as the Scotch pine, spruce fir, &c. may be transplanted in the last week of the month, but not safely before. They are often put in during any of the winter months, but the result shows the impropriety of the practice.

Fill up islands (5685.) in young plantations and hedges, and fill timber, cut over coppice woods, and thin out young woods as in last month. When plantations are to be raised from seed where they are to remain for timber (5645.), this is the month for most seeds, but April is better for the pine and fir tribe. Sow the others in the second or third week of the month, and if resinous trees are to be mixed, a sprinkling of their seeds can be sown over the others in April.

APRIL.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	REMARKS.	
			Average of the Barometer.	Quantity of Rain.
London	49 9	3	29 77	1.460 inch.
Edinburgh	46 3		29 873	2.414
Dublin	51 125		29 909	2.561

1. Kalendar of Animated Nature round London.

In the first week: the viper (*coluber berus*) and woodlouse (*aspidius asellus*) appear; the misseltoe-thrush (*turdus viscivorus*) pairs; frogs (*rana*) croak and spawn, and moths (*phalaena*) appear.

Second week: the stone curlew (*charadrius edicnemus*) clamors; young frogs (*rana temporaria*) appear. The pheasant (*phasianus*) crows; the trout (*salmo trutta*) rises; and spiders (*aranea*) abound.

Third week: the crested wren (*motacilla regulus*) sings; the blackbird (*luscinia megarhynchos*), raven (*corvus corax*), pigeon (*columba domesticus*), hen (*phasianus gallus*), and duck (*anas boschas*) sit; various insects appear; and the fieldfare (*turdus pilaris*) is still here.

Fourth week: the swallow (*hirundo rustica*) returns; the nightingale (*motacilla lucicola*) sings; the bitters (*larus rostratus*) makes a noise; the house martin (*delichon urbica*) appears; the black-cap (*motacilla cinerea*) whistles; and the common snake (*coluber aspidus*) appears.

2. Kalendar of Vegetable Nature round London.

In the first week: the daffodil (*narcissus pseudo-narcissus*), the garden hyacinth (*hyacinthus orientalis*), the wallflower (*cheiranthus cheiri*), the cowslip (*primula officinalis*), the periwinkle (*vinca*), sloe (*prunus spinosa*), and various other herbs and trees in flower.

Second week: the ground-ivy (*glehnia hederacea*), gentianella (*gentiana acutifolia*), primula, virginica, the gentianella, beris sempervirens, omphalodes, verba, and most of the common fruit-trees, and fruit-shrubs in flower.

Third week: some robins, andromeda, halmia, and other American shrubs; daphne laureola, ulmus campestris, chrysothamnium oppositifolium, mercutialis perennis, and other plants in flower.

Fourth week: the beech (*agus*) and elm (*ulmus*) in flower; ivy-berries drop from the racemes; the larch in leaf, and the tulip and some white narcissal and fritillaries in flower.

3. Farm-yard. (2740.)

This month will in most situations terminate the wintering of cattle in the straw-yard. Straw is now very dry, therefore turnips, or other green food or roots, should be added in proportion.

Horses should be kept in high order on account of the hard work and extra exertion often required of them during this month. If there are carrots or potatoes to steam for them once a day, that will greatly aid hay and corn; if not, steam a part of the hay.

The accident supplies of food for store pigs and poultry are less abundant during this month, because less time can be spared for threshing. There are fewer wintering cattle, and the yards are generally now cleaned out for the field dung-hills.

4. Live Stock. (5546.)

The end of this month is a good time for mares to foal (5960.), and they should have the barest economy (5961.) stand at the proper periods first to moderate working, and then to entire ease before foaling time. (5972.)

Cows must still be well fed with roots or steamed food, within doors, letting them taste the grass occasionally towards the end of the month. (6183.)

The accident generally require a good deal of artificial food during the first half of this month. When the turnips are expended, clover hay, grains of barley which have been malted, rape cake or linseed cake, are the next resources. (5472.) About the end of the month they may be turned on the pasture, and then it is that season generally drops in price:—a hint to the farmer to sell all he can in the early part of April.

Where (there are water-meadows, the sheep and lambs will have been fattening on these during the whole of the month, — an immense advantage to a farmer.

Poultry of most kinds have now hatched their broods, and require looking after, to see they do not injure one another, nor are attacked by stronger enemies.

5. Grass Lands. (5086.)

See that the fences are kept up, and the gates regularly shut and fastened; as cattle newly let out are very apt to wander, and more ready to break through fences than when the herbage is more abundant.

Water-meadows (5053.) are generally shut up for hay about the end of the month, the ewes and lambs being then turned on young artificial grasses, or common provincial pastures, in a sufficiently forward state.

Mowing-meadows of the common kind (5197.), and clovers, and mixed grasses for hay, should be hand-picked, bush-harrowed, and rolled, early in the month, and then shut up for the scythe.

6. Arable Lands. (4548.)

Finish sowing all the spring corns (4659.), pease, tares, lucern (5025.), saintfoin, and all other herbage, plants, and grasses. (5086.)

Summer wheat (4602.) may be sown during the whole of the month, also barley in late situations (4659.), pease for late podding, and under peculiar circumstances, tares for cutting green in October and November.

Manufactorial plants, as wool, madder, flax, hemp, mustard, &c.; oil plants, as rape, poppy, and such plants as are grown for medicinal purposes or peculiar uses in domestic economy, as rhubarb, liquorice, buck or beech-wheat, cress, &c. may all be sown or planted from the middle of last to the middle of this month. The first week in April, will, in the greater number of seasons, soils, and situations, suit the most of them.

Carrot (4962.), field beet (4926.), parsnep (4951.), and Swedish turnip (4880.), if not sown the last week of March, should be finished during the first ten days of April. A bed of Swedish

turnips should be sown in the garden for transplanting in the field by the end of the month, or the first week in May.

The last fortnight of the month is the best season for planting potatoes (4825.); in the earliest situations this is soon enough for a full crop; in the latest the middle of May will answer better. For very early crops for the supply of summer markets, dry rich sheltered fields may be planted in March. In the moors of Scotland they often plant in June, and still have a crop; there the potatoe is alike obnoxious to late spring and early autumnal frosts.

7. Fences (2767.), Roads (3280.), and Drains. (3909.)

All these should have been put in order before, so as to leave the hedger of the farm (6929.), and the laborer of all-work (5986.), time to assist in getting in planted crops, as potatoes, cabbages, &c. in the fields, cropping the garden, mowing, or otherwise dressing the orchard, shrubbery, lawn, or such ornamental or enjoyment ground, as the farmer indulges in round his house.

8. Orchards (3770) and Hop-grounds. (5393.)

In some cases fruit-trees may be so overladen with blossoms towards the end of the month as to make it worth while to brush wet straw under them; but this rarely happens before the middle of May, and even then farm orchards may almost always be left to the birds and vigor of the trees. Hops are generally potted in this month, and the ground between the hills afterwards stirred with the cultivator or ridglet as it is called in Kent. (5417.)

9. Wood Lands and Plantations. (3627.)

All planting and pruning of deciduous trees should be finished the first week of the month. Afterwards the planting and pruning of evergreens may commence; first the common pine and fir, and afterwards the holly, yew, and other forest evergreens. (3655.) If these can be watered, and staked, so much the better. Barking oaks may in some warm situations be felled the last week of the month, but May is the more general time. (3748.)

MAY.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.
London	56 61	2 5	30 08	0.794 'ach.
Edinburgh	50 4		29 585	1.943
Dublin	52 193		30 061	1.512

REMARKS.

Vegetation now goes on with great vigor, though there are often very cold and even frosty nights, which materially injure the blossoms of fruit-trees, and sometimes the young shoots of the hop and potatoe. Man, in common with other animals, being now full of life and vigor, the consummation of animal desire is frequent; but the marriage is better deferred till September, when the offspring will be born in the May or June following, a season of the year when the poor man can better support the expenses of an accouchement than in the cold month respondent to marriages in May.

1. Kalendar of Animated Nature round London.

In the first week: the titlark (*alauda pratensis*) sings, the cuckoo (*cuculus canorus*) is heard; the grudgion (*oprymus gobio*) appears; the redstart (*monticola caesia*), with (*hirundo apas*), white-throat (*molucilla sylvia*), and stinging-fly (*compes calcitrans*) appear.

Second week: the turtle-dove (*columba turris*) coos; the red ant (*formica rubea*), the laughing wren (*molucilla carolinæ*), the common flesh-fly (*musca domestica*), the lady-cow (*coccinella bipunctata*), grasshopper lark (*alauda leucola*), coot, and willow-wren (*molucilla salicaria*), appear.

Third week: the blue flesh-fly (*musca vomitoria*) appears; black snails (*helix nigra*) abound, and the large bat appears.

Fourth week: the great white-cabbage butterfly (*papilio brassicae*), and the daisy (*bellis 4-maculata*) appear; the glow-worm shines, and the kern-owl, or goat-sucker (*caprimulgus europæus*) returns.

2. Kalendar of Vegetable Nature round London.

In the first week: geum urbanum, artemisia campestris; lily of the valley (*convallaria majalis*), water-violet (*helionio palustris*), tulip-tree (*liriodendron tulipifera*), and numerous other plants in flower.

Second week: the oak, ash, sweet chestnut (*figus cactanea*), hawthorn (*mespilus oxycantha*), the common maple (*acer cinerastre*), horse-chestnut (*aeucalis hippocastanum*), barberry (*berberis vulgaris*), and the ajuga reptans in flower.

Third week: the water scorpion-grass, or forget-me-not (*myosotis scorpioides*), lime-tree (*tilia*), milk-wort (*polygala vulgaris*), nightshade (*strypus belladonna*), and various American shrubs in flower; and fig (*ficus hyderum*) in ear.

Fourth week: oaks, ashes, and beeches now generally in leaf, and the mulberry (*morus nigra*) beginning to open its buds. The cinnamon rose, and some other hardy roses in flower; and also the bramble (*rubus fruticosus*), moneywort (*lysimachia nummularia*), columbine (*anagallis vulgaris*), and various other trees and shrubs in blossom.

3. Farm-yard. (5740.)

Feeding and wintering on straw and roots generally ends, and soiling (5004.) or pasturing (5017.) commences, in the first fortnight. Where high-flavored milk and butter are preferred to quantity, then pasturing on dry-bottomed uplands is to be preferred; but where quantity and richness is the object, soiling with clover and tares, and two or three hours' pasturing per day, for the sake of exercise, is the preferable system. Even on farms where there is nothing to mow but old meadow, soiling with that will be found more economical than pasturing it. A field of meadow in good heart, mown and eaten green, will, at a rough estimate, produce treble the quantity of milk it would have done if pastured, and four times as much as it would do in the form of dry hay.

The yards and pits are generally cleared of dung, urine, &c. at this season; and if no soiling room on, they should be kept

clean during the summer, excepting what room is required for the dung of the few stock which are there constantly, as pigs and poultry, or occasionally, as horses while harnessing, &c.

4. Live Stock. (5546.)

In turning cattle to grass, consider the different systems of pasturing (5240); adopt what suits your circumstances, and pursue it regularly. Note that water is not wanting to each field (1127.); nor shade, rubbing posts, and shelter. (5256.)

Lambs are generally dand during this month, from the number of persons who buy in and feed off on grass. When cattle or sheep are very numerous, they are found to feed better, and do less injury to the grass, in small herds or flocks than in large ones.

Mares may have the horse during the first week, but not later, considering the season of parturition. (5568.)

5. Grass Lands. (5086.)

As most grasses send up their flower-stalks during this month, it is of importance as to stock pastures, as to cut these down.

This is only to be accomplished in recently sown downlands by overstocking, and not then completely if ryegrass prevails. When grass-lands are to be mown, the best crop of hay will be obtained by not pasturing after the middle of April. Some may think that where cattle and sheep are fed till May or June, the stalks left will come in as hay; but as such fields cannot be mown till the end of July, the stalks have long before shed their seed and become dry, and so shrivelled as to be unfit for food.

Where paring and burning is wanted, this is a favorable season. (5371.)

Water-meadows having been eaten down in April, are generally watered for the first three or four weeks of this month, to bring forward the crop of hay. (4096.)

6. Arable Lands. (4548.)

Summer wheat (4602.) and grass seeds (4602.) may still be sown, but not profitably after the first week or ten days. Swedish turnip (4889.), marygold, and yellow turnip, may be profitably sown, and also early crops of common white turnip where the soil is clean and dry prepared. (4887.)

The preparation of turnip fallows is the great business of this month, and next the stirring of naked fallows (4568.), and the culture, by horse and hand hoe, of corns and pulses in drills. In late situations potatoes may be planted during the whole month (4843); and hemp and flax sown during the first fortnight. (5222. and 5327.) Tares for successional supply. (4795.)

7. Fences (2767.), Roads (3280.), and Drains. (3909.)

Clean young hedge-rows. (2789.) Drains may now be advantageously designed, as the springs show themselves more con-

spicuously during winter. The rest in this department is more routine.

8. *Orchards (3770.) and Hop-grounds. (5393.)*

Grafted trees should be looked over occasionally, and any that the clay has dropped from recovered. Remove suckers and superfluous side shoots.

Sixth and clean the hop-plantations; place the poles, tie the vines where necessary, and towards the end of the month, when the number of shoots wanted have taken the lead, cover

the stool or centre of the plant with a small hill of soil, to prevent it from sending up more shoots.

9. *Wood Lands and Plantations. (3627.)*

Continue to bark oak trees, and also the larch, and such others as are adapted for the farmer (3740), but finish, if possible, by the middle of the month. Keep newly-planted large trees properly staked, and all kinds of cultivated ground clear of weeds.

JUNE.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London	63 32	2	29 93	0.532 inch.	The weather is sometimes cold at the beginning, but is generally agreeable and steady towards the middle of the month. By observing the columns indicating the greatest variation of the thermometer in each month, it will be seen that it varies, in London, only two degrees in June, which is less than in any of the preceding months. In July and August the variation is the same; but in March and October it is twice as much.
Edinburgh	67 2		29 666	1.935	
Dublin	66 76		30 06	0.860	

1. *Kalendar of Animated Nature round London.*

In the first week: the sedge-sparrow (*passer arundinaceus*), the fly-catcher (*musciopora atricapilla*), the wisp (*vespa vulgaris*), and several species of the bee and butterfly appear.

Second week: the barrow moth (*spina filipendula*), and forest-fly (*alpheonox squina*) appear; bees swarm.

Third week: several flies, butterflies, moths, beetles, and other insects appear.

Fourth week: insects abound; and singing-birds begin to retire to the woods, and leave off singing.

2. *Kalendar of Vegetable Nature round London.*

In the first week: water-lilies (*nymphaea*, cf. *cuphea*) flower; also iris pseud-acorus, anemones cotula, polygonum persicaria, malva rotundifolia, and numerous other plants.

Second week: the vine, raspberry, and elder in full flower; also various Scotch roses (*rosa spinosissima*), broom (*sparthum*), nastie (*arctium*), and wheat in the ear.

Third week: the orchis, epilobium, iris alpinum and siphiloides, the hardy lily and gladioli, and a great variety of garden and field plants in flower; also the wheat and many of the pasture grasses.

Fourth week: some black and red currants ripe, strawberries in abundance; young shoots of trees and shrubs have nearly attained their length. Oats and barley in flower; blue-bottle, scabious, (*camosma cymosa*), and numerous others in bloom.

3. *Farm-yard. (3740.)*

Soiling is the principal operation now going forward (5004), and requires the utmost attention to the cleanliness of the animals, whether fattening cattle, feeding milch cows, or horses.

4. *Livestock. (5546.)*

Wash and shear sheep (6441.); examine flecks individually as to the fly (6436.); see to shade for every description of stock when the weather is hot. Bees swarm during this and next month.

5. *Grass Lands. (5086.)*

Hay-making is now a principal business (5006. and 5217.) Any tussocks or flower-stalks (berns) which appear, not-

withstanding the close seeding of April and May, should now be mown (5601.) thickets and similar weeds cut close by the root (5546.); pure and burn as in May (5971.) clean out ponds, water-courses, wells, &c. See that clovers, tares, or other sowing crops are mown close to the soil.

6. *Arable Land. (4548.)*

Great part of the turnip process goes on during the three first weeks of this month and the latter half of May. (4976.) Dung fallows and otherwise bring them forward (4598.); draining (3909.), levelling, altering ridges, &c., as the case may require; weed broad-cast crops, and stir the soil between such as are in rows. Warping, where it can be practised, may now be commenced (4117.); thin out the first sown turnips. (4893.)

7. *Fences (3767.), Roads (3280.), and Drains. (3909.)*

Weed hedges, but avoid clipping them, which only creates a close surface of feeble shoots, that in the end becomes so thick as to exclude light and air from the central stems, and occasions their languishing and death. (3792.)

Dig and otherwise prepare materials for roads (3386.) and drains. (3963.)

8. *Orchards (3770.) and Hop-grounds. (5393.)*

Insects, or other effects of what are called blights, can seldom be destroyed on so large a scale as that of the farm-orchard or hop-garden. Burning weeds or wet straw, litter, &c. will do something; and on a small scale, washing with lime-water, soap-suds, tobacco-water, or a mixture of these, will prove effectual. (3440.) Those who tie the binds or vines of the hop to the poles, instead of leaving them to nature, have generally completed the operation by the middle of the month. In some early spots the superfluous shoots are cut off about the end of the month.

9. *Wood Lands and Plantations. (3627.)*

The wood-man is now chiefly employed in trussing up the branches of barked trees, and otherwise disposing of what is unfit for timber purposes. (3745.) Old copes or stools of trees, woods, or hedgerows, may now be advantageously stocked up, stacked, and, when dry, charred for fuel. (3762.)

JULY.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London	66 3	2	29 89	2.194 inch.	This was called <i>July weather</i> by the Saxons; and though hay-making near London is generally finished in June, yet in places where manure is less abundant, it is chiefly made in this month. The farmer's prospects as to crop may now be determined as to almost every article cultivated.
Edinburgh	60 61		29 445	2.546	
Dublin	61 13		29 929	2.614	

1. *Kalendar of Animated Nature round London.*

In the first week: the cuckoo (*cuculus canorus*) leaves off singing; the stone-curlew (*charadrius edicnemus*) whistles occasionally late at night, and the golden-crested wren (*motacilla regalis*) now and then chirps.

Second week: the quail (*tetrax ferrugineus*) calls; the cock-sparrow, or frog-hopper (*causis pyramidalis*) abounds.

Third week: young *Corvus migrator*. Hens moult.

Fourth week: the great horse-fly (*tabanus bovinus*) appears; and partridges fly.

2. *Kalendar of Vegetable Nature round London.*

In the first week: enchanters' nightshade (*circus latidans*) and lavender (*lavandula spica*) in flower, and pinks and carnations in full bloom.

Second week: the fallen star (*tremula montana*) appears; also puff-balls (*typhlocydon bovista*), and sometimes the common mushroom (*agaricus campestris*).

Third week: raspberries and gooseberries ripe, potatoes in flower, asparagus in berry, the lilliums in perfection.

Fourth week: the truffle (*tuber cibarium*) now hunted, or dug up in commons and forests; nightshade (*solanum nigrum*), devil's bit (*scabiosa species*), burnet-saxifrage (*plimnula saxifraga*), and a great number of plants in flower.

3. *Farm-yard. (3740.)*

As in June; between hay and corn harvest is generally a very good time for the farmer to make a tour to observe more extensively the practices of his own district, and to witness those of other districts.

4. *Livestock (5546.) and Grass Lands. (5086.)*

Lambs are now weaned (6428.) when not fattened off; at first they require the richest keep. As green food will now be abundant, every animal about a farm that can live and thrive or answer its end by the soiling system, should be so treated. The weather being hot, cattle or sheep in fields must be frequently looked to, as to shade, water, and abundant keep. Buffaloes from thence, or a want of food, they are very apt to break through fences, which at this season is more than usually injurious, on account of the state of the corn crops.

6. *Arable Lands. (4548.)*

Attend to weeding, hoeing, and otherwise moving the soil between rowed crops, more especially potatoes and turnips. Towards the end of the month, the first-sown white turnips will be in a state to thin out; and a farther thinning may be advantageously given to field beet, carrots, &c. at this season. Where pease are sown for podding, they will now be in

abundance for gathering; in warm situations sooner. Buck wheat may now be sown for autumnal food for game. (5460.)

7. *Fences (3767.), Roads (3280.), and Drains. (3809.)*

As in June.

8. *Orchards (3770.) and Hop-grounds. (5383.)*

Cherries, strawberries, gooseberries, &c. where grown as field-crops, are now in gathering, and towards the end of the month, fallen apples and pears for tarts. Hop-grounds are looked over, and the superfluous vine pruned off, &c. In Kent

and other places these prunings are often a profitable of the pruner, who lays these aside as fuel for cove.

9. *Wood Lands and Plantations. (3687.)*

As in June; and prune the gum, which at other seasons is apt to bleed. (5692.) This season is very perfectly for pruning all sorts of trees, and if their leaves and spray were an object for fodder, as in Sweden and Italy, no doubt it would be preferred. (3691. and 3693.) Wounds in trees do not now bleed, and are sometimes do in spring and autumn, and they heal, and are in part covered over with bark, before the approach of winter. (3695.)

AUGUST.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.
London -	65 85	2	30 06	0.894 inch.
Edinburgh	60 85		29 928	1.926
Dublin -	62 82		30 173	5.558

REMARKS.

This is the best, or harvest month of the Saxons; and, as every body knows, the busiest month of the agriculturist. It is, in consequence, the most profitable season for the laborer and his family, who are generally in full employ, and at an increase of wages, or perquisite, for four or six weeks at this season.

1. *Kalendar of Animated Nature round London.*

In the first week: flying-ants (*Formica*) appear; bees kill their drones; and the swallow-tailed butterfly (*Papilio machaon*) appears.

Second week: young martins (*Hirundo urticae*) and swallows (*Hirundo rustica*) begin to congregate, and swifts (*Hirundo apus*) to depart; the whitethroat, or burr-die (*Oenanthe isabellae*) lays eggs on hedges.

Third week: the black-eyed marble butterfly (*Papilio caerulea*) appears. Various birds resume their spring notes.

Fourth week: the nuthatch (*Sitta europaea*) chatters, the stone-curlew (*Oleuthria scintillans*) whistles at night, the goat-sucker (*Caprimulgus europaeus*) and young owls (*Nyctaleus alba*) make a noise in the evening; robin-redbreast (*Merula rubra*) sings; and rooks roost on their nest-trees.

2. *Kalendar of Vegetable Nature round London:*

In the first week: meddlet (*Trifolium officinale*), rue (*Ruta graveolens*), yellow saucery (*Picris hieracoides*), burdock (*Achillea lappula*) in flower; the leaved-corn rye.

Second week: wild clay (*Salix virens*), meadow-rue (*Thalictrum flavum*), ploughman's spikenard (*Oenanthe aquerraria*), and various other natives in flower.

Third week: the mallow (*Malva*), leucostem, hollyhock (*Alcea rosea*), and lobelias, among the garden-flowers; and the poly-anthus and potamogetons among the wild plants now in blossom.

Fourth week: the autumnal crocus (*Colchicum autumnale*), aster, solidago, senecio paludosus, tassel (*Alpestris fulgens*), and various other plants in flower. The earlier varieties of all the hardy kernel fruits ripe.

3. *Farm-yard. (2740.)*

The rich-yard should now be attended to (2744); stack-stands repaired or put in order; bottoming of faggots, and straw or rape haulm got together; thatch in readiness, and ropes made. (3947.)

At any spare period the teams may be employed carting out the summer-made dung to the wheat fallows, or to form field dunghills for spring crops, &c.

4. *Live Stock. (5546.)*

Select the stock of lambs to be kept as breeders. (6454.) Swine commonly bring their second litter of pigs in this month, which, owing to the dropping corn, is generally one of abundant keep, both for them and poultry. Farmers in some places look to the stables as a source of good food for their cows, as

others do to the fallows for keep for their sheep. Where either is the case, the culture must be of a very inferior description.

5. *Grass Land. (5086.)*

Where meadows are mowed, that operation generally goes on after the hay is removed, or during a rain; the surface in the former case being hard with drought, and in the latter by frost. A grass-sward should in general be shut up and reserved for later hay, and in some cases as a winter resource. Keep down weeds, tussocks, anthills, &c. Turn the water on meadow-lands as soon as the hay is removed, and let it remain till a third crop is in forwardness. (4058.)

6. *Arable Lands. (4548.)*

Weed and stir among green crops, earth up potatoes (4633.), but by no means turnips, as that operation only prevents them from attaining a full size. (4893.) Reaping commences in all the southern districts in the first week of this month, and in some by the middle of July. When the operation is executed by day-work, the most unremitting inspection of the master is necessary; and even when the greater preferable mode of reaping by the acre is adopted, he should be continually in motion from one party to another, to see that the operation is performed low and clean.

Naked fallows in late situations receive the seed furrow during this month, excepting in cases where the soil is ploughed in, an operation generally referred to the middle of September. Sow cabbage-seeds (4969.) for plants to put out in April next. Sow turnips after early pease which have been podded (4753.), or early cut wheat, tares, cabagees, &c. or after hemp and flax, which are generally pulled by the middle of this month. (5192. and 5327.) Grass seeds sown alone at this season (4925.) will generally succeed better than at any other; they germinate as well in spring, but the heats of July often burn up the tender plants.

7. *Fences (3767.), Roads (3280.), and Drains. (3809.)*

As in the two preceding months.

8. *Orchards (3770.) and Hop-grounds. (5383.)*

Apples and plums of some sorts are now ripe. Grafts may in general be united. Budding performed, and pruning, if desirable, as observed last month under woods and plantations.

9. *Wood Lands and Plantations. (3687.)*

See last month.

SEPTEMBER.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.
London -	59 65	3 5	30 09	0.482 inch.
Edinburgh	54 3		29 739	3.470
Dublin -	56 35		30 239	5.021

REMARKS.

The temperature begins now to decline and to vary; the nights begin to lengthen, and heavy dews and diminished transpiration and evaporation promote the growth of grass, herbage, plants, and especially turnips. This is still a busy month with the agriculturist; in the warmest situations he is finishing harvest-work, and in the latest commencing it. A small of most sorts are now fit; fruits are ripe; honey abundant; and most products of the earth in perfection and plenty.

1. *Kalendar of Animated Nature round London.*

In the first week: young broods of goldfinches (*Fringilla car. caesia*) appear. The linnet (*Fringilla linnaea*) congregates. The bull (*bos taurus*) makes his shrill autumnal noise; and swallows (*Hirundo rustica*) sing.

Second week: common owls (*Nyctaleus alba*) hoot. The saffron butterfly (*Papilio lyside*), and willow red under-wing moth (*Phalaena podii*) appears. Herrings (*Clupea harengus*) are now cheap.

Third week: the ring ouzel (*Turdus torquatus*) appears. The fly-catcher (*Muscivora cyathiger*) withers.

Fourth week: the star (*Alnus vulgaris*) congregates. The wood-lark (*Alauda arvensis*) sings. The woodcock (*Scolopax rusticola*), and fieldfare (*Turdus pilaris*) appear; and the swallow (*Hirundo rustica*) departs.

2. *Kalendar of Vegetable Nature round London.*

In the first week: the fungus balanus albus appears, traveler's joy (*Geranium silve*), and perennials palustris in flower.

Second week: catkins of the hazel and birch formed; blossoms, and green, red, and black berries found on the bramble at the same time. Leaves of the chamomere, birch, lime, mountain-ash, and elm begin to yellow.

Third week: the ivy (*Hedera helix*), laurel (*Prunus lauro-cerasus*), and furze (*Ulex europaeus*) in flower.

Fourth week: hips, haws, and nuts ripe. Leaves of plane-tree (*Platanus*) tawny; of the hazel, yellow; of the oak, yellowish-green; of the sycamore, dirty brown; of the maple, pale yellow; of the ash, fine lemon; of the elm, orange; of the hawthorn, tawny yellow; of the cherry, red; of the hawthorn, bright yellow; of the willow, hoary.

3. *Farm-yard. (2740.)*

The rich-yard is now the chief scene of operations, in getting earlier crops thatched (2946.) and later ones stacked. (3035.) In all operations in this department attend, as far as circumstances will permit, to neatness. In the use of a proprietor or amateur, neatness, order, and high keeping are essential in every department.

4. *Live Stock* (5546.)

There is generally abundance of fat cattle and sheep in the market during this and next month. Lean stock, especially crosses and waddlers, are now brought in, and wintered or fed off on turnips. Wintering cattle (5177.) also about the end of the month. Poultry and pigs are now fat, and honey may be taken from bee-hives.

5. *Grass Lands* (5086.)

As in August. Newly sown grass lands should now be sparingly fed, in order to strengthen the plants for the winter.

6. *Arable Lands* (4548.)

This is the chief season for sowing winter wheat, whether on mowed fallows or after clover, tares, rape, or early crops of peas and beans. Potatoes are generally not taken up till the end of the month, in which case the sowing after that crop is later. (4613.) Sow tares to stand the winter (4795.), and grass seeds

for permanent pasture, or a hay crop next season will succeed on good soils, if sown before the middle of the month. (4995.)

7. *Fences* (3767.), *Roads* (3280.), and *Drains* (3909.)

Routine operations of mending, &c. as before.

8. *Orchards* (3770.) and *Hop-grounds* (5393.)

Gather *fruits* for immediate sale, the keeping sorts not being yet ripe. (3776.) Walnuts for pickling not later than the first week. (3789.)

Hop-picking and drying, in the districts where this plant is much cultivated, is the great business of the month. (5425.)

9. *Wood Lands and Plantations* (3627.)

Routine operations as in the two or three preceding months. plant evergreens during the three last weeks, and deciduous trees the last ten days. (3655.)

OCTOBER.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.
London	52 81	4	29 69	2.027 inch.
Edinburgh	49 7		29 359	5.334
Dublin	51		29 76	2.798

REMARKS.

The weather of this month is very uncertain. Before those rains, snows, or frosts which constitute the practical commencement of winter, there is generally two or three weeks of settled weather; sometimes these weeks are in October, sometimes partly in November. These weeks afford a last resource for bringing forward neglected operations.

1. *Kalendar of Animated Nature round London.*

In the first week: the red-wing (*carduus ilianus*) arrives. Snakes and vipers bury themselves.

Second week: hooded crows (*corvus corax*) and wood-pigeons (*columba palumbus*) arrive; hen-chaffinches (*fringilla canina*) congregate, and prepare for migration, leaving their males in this country.

Third week: the snipe (*scopus gallinago*) appears in the meadows. Wild-geese (*anser sylvestris*) leave the fens, and go to the eye-lands.

Fourth week: the tortoise (*testudo graeca*) begins to bury himself in the ground; and rooks visit their nest-trees. Some larks (*alauda*) sing, and the woodcock (*colaptes rusticola*) returns. Snipe's webs abound.

2. *Kalendar of Vegetable Nature round London.*

In the first week: strawberry-tree (*arbutus uva-ursi*), holly (*taxus aquifolium*), China hollyhock (*alcea chinensis*), and China aster (*aster chinensis*), in bloom.

Second week: catkins of some species of *salix* formed; leaves of the map almost all off; of the Spanish chestnut, yellow; of the sugar-maple (*acer saccharinum*) scarlet; of the common birch, yellow and gold; and of the weeping-birch, gold and bright-red colored.

Third week: clematis calycina in flower. Some horse chestnuts and acacias quite denuded of leaves.

Fourth week: various plants, especially annuals, continue in flower. Leaves of marsh-elder (*sambucus alba*), of a fine pink; of stag-horn sumach, of a purplish-red; of the American oak, of fine shades of yellow, orange, red, and purple.

3. *Form-yard* (3740.)

This is the season of rural plenty, affording an opportunity, both to men and animals, for laying in a large stock of health, to enable them to support the severity of the coming winter. Operations should now buy in their winter stores of potatoes, fuel, &c. and ridge up their garden ground, not under crop, for the winter.

[Crops being generally in the rick-yard by Michaelmas, and the root and herbage crops not taken being at or near maturity, the first of October is the most suitable season for a farmer to take stock and ascertain his annual profit or loss. Michaelmas being also the most general term of entry and removal, especially in the case of arable farms, is another reason why agricultural accounts are conveniently made up to this period. (4508.) Examine your household accounts, and if your expenses have exceeded your income, or even come up to it, look over the particulars with your wife or housekeeper, and see on which you can retrench. This is an essential process for all who would proceed in life with any thing like peace of mind, or the permanent respect of their neighbors. (4345.) Remember that very small indeed is the net income of a retreating agriculturist.]

Michaelmas is also the general term for hiring farm servants by the year; but the seldom agricultural operatives are changed the better, unless in the case of senseless, indolent, or viciously inclined persons, who degenerate unless frequently removed.

4. *Live Stock* (5546.)

Cattle and sheep not sufficiently fitted on grass or herbage whether by pasturage or soiling, should now be put on other food, to complete them for the butcher. Old-cake, grains, turnips, carrots, or, in default of these, bruised corn may be used. The same observations may be applied to hogs, which are generally in good condition at this season. (5574.)

Hog porridge. A mixture of oatmeal and water, or any other meal and water, left till it becomes sour, as practised by the millers in the northern counties, will feed hogs rapidly; but milk and pease meal make the finest pork in the world.

The towns which have been soiled during summer, may now be put on hay, straw, and carrots, or other roots, by degrees. (5063.)

5. *Grass Lands* (5086.)

Where these are manured, this is a good season for the operation (5086.); choose dry weather.

6. *Arable Land* (4548.)

Potatoes (4525.), carrots (4926.), field beet (4962.), parsneps (4061.), and Swedish turnips, may now be taken up and housed, and the ground sown with wheat. This grain (4599.), rye (4630.), barley (4659.), in some situations, and tares (4795.) may still be sown in the milder in the first part of the month. The towns which have been soiled during summer, may now be put on hay, straw, and carrots, or other roots, by degrees. (5063.)

7. *Fences* (3767.), *Roads* (3280.), and *Drains* (3909.)

Hedges may now be advantageously planted (3785.), grown ones pruned (3790.), old ones picked (3786.), and imperfect ones repaired. (3800.) The Northern practice as to hedges (7094.) well deserves the study of the more southern agriculturist. Roads and drains may be made or repaired at this season, and in spring, with better effect than during the heat and drought of summer. Road materials now bind better, and land-springs show themselves more distinctly.

8. *Orchards* (3770.) and *Hop-grounds* (5393.)

The winter fruits may now be gathered, and either spread in an airy loft or upper floor, there to remain till used, or sweated in heaps, to extract a part of their moisture, and then buried in dry sand, or packed in close boxes or casks, to be kept in a cool and dry cellar. (1797. and *Encyc. of Gardening*, 5285.)

Fruit trees of every kind may now be planted (3795.) and pruned. (3798.)

Hop-picking is generally completed the first week of the month; and as soon afterwards as convenient, the vine and peas removed, and the latter stacked till next spring. (5432.) Young hop plantations may be formed (5393.), and the soil among established grounds manured and ploughed. (3411.)

9. *Wood Lands and Plantations* (3627.)

Hedges and plantations of evergreen trees may be made during the first week of the month; and no period of the year is better for transplanting all kinds of hardy shrubs.

Timber and coppice may be felled, and in general every operation preparatory to planting, as well as the operation itself, may go forward.

NOVEMBER.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.
London	44 44	4	29 68	2.597 inch.
Edinburgh	41 1		29 638	4.514
Dublin	43		29 74	0.394

REMARKS.

This is the windy month of the Saxons; it is generally also cold and moist, and one of the most disagreeable for the laboring agriculturist; but he may console himself with the shortness of the day, and hail the approach of evening, when he may lay aside his wet dress and fortify his mind by converse with books, or enjoy the comforts of his fire-side, and the solace of his wife and children; reading to or otherwise instructing them, or mending his boots or shoes.

1. *Kalendar of Animated Nature round London.*

In the first week: the buck (*capreolus*) grunts.
 Second week: the golden plover (*charadrius pectoralis*) appears.

Third week: snails (*limas*) and slugs (*helix*) bury themselves.

Fourth week: greenfinches (*fringilla montifringilla*) flock. The winter moth (*geometra brumaria*, Sam.), and the common flat-body moth (*geometra opiformis*, Sam.), appear in gardens about the end of the month.

2. *Kalendar of Vegetable Nature round London.*

In the first week: a few plants in flower, by accident, chiefly annuals, according to the season.

Second week: the fungus *hevelia mitra* appears. *Lauris-jinus* in flower.

Third week: *calycanthus procumbens* in flower.

Fourth week: some primroses show flowers at this season; and some plants, unnaturally in flower, still continue if the weather is temperate.

3. *Farm-yard. (3740.)*

Wintering cattle are now introduced to the straw yards (3740.) or trammels (3677.), and others to stalls for feeding or fattening. Live stock in general ought to be kept in good condition at this season, otherwise they are apt to fall off towards spring. Threshing goes on at intervals to supply straw. (3661. and 3623.)

4. *Live Stock. (5546.)*

See farm-yard.

5. *Grass Lands. (5086.)*

Manure in dry weather (5008.); turn the water on meadows adapted for irrigation (4068.); destroy anthills (5802.); drain by surface gutters, or other means, where that operation is requisite; clear out water furrows for the same purpose; admit cattle and horses only on the driest pastures; see that sheep have shelter, and especially Dorset ewes likely to lamb next month.

6. *Arable Land. (4548.)*

See that water furrows and drains run unobstructed; plough and cart out manure, (as weather and other circumstances permit.

7. *Fences (3767.), Roads (3280.), and Drains. (3909.)*

As in last month; and see that they are in effectual repair, and fairly used.

8. *Orchards (3770.) and Hop-grounds. (5393.)*

Complete the operations of last month, where interrupted, deferred, or neglected.

9. *Wood Lands and Plantations. (3627.)*

As in last month, excepting when the weather is unfavorable. Felling all kinds of timber and coppice not adapted for barkings for the tanner, may now go on freely. (3740.) Willowen for baskets may be cut over (3738.), and baskets, hampers, crates, and hurdles, made by the woodman and hedger.

DECEMBER.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London -	41 4	3	29 64	1-124 in.	Winter month, Sax. Cold but dry. The agricultural operations are chiefly of the laborious kind; but the days are short and the nights long. In the last week the young operator should examine himself as to his professional and intellectual progress during the bye-past year, and form plans for further improving himself for the year to come. Knowledge is a lever by which a man may raise himself as high as he desires.
Edinburgh -	38 9		29 66	2-598	
Dublin -	36 34		29 723	2-916	

1. *Kalendar of Animated Nature round London.*

The mole (*talpa europaea*) throws up hillocks. The December moth (*epigastis populi*, Sam.) appears about the beginning, and the yellow-line quaker (*notus flavolinea*, Sam.), about the end of the month.

2. *Kalendar of Vegetable Nature round London.*

Some of the last month's plants continue in flower, according to the weather.

3. 4. *Farm Yard (3740.), and Live Stock. (5546.)*

Threshing, and otherwise preparing corn and straw for the market, and the use of the working, fattening, wintering, and store stock are the main operations. Next, the regular supply of live stock with food, and cleaning and littering them. Fattening stock should be particularly attended to, especially house lamb (6486.) and calves (6167.)

The supply of turnips for cattle and sheep is liable to be interrupted by severe frosts, if the precaution of housing a quantity (4904.), or setting them (4905.), is not taken in time. Where oil cake, rape cake, or dust, (5472.) brewers or distillers' grains (4686.) are used, supplies must be secured; and where hogs or cattle are fed on meal and water mixed and soured, a quantity must always be kept in mixture; as a week or ten days in temperate weather, and a longer period during frost, is requisite to induce the fermentation.

5. *Grass Lands. (5086.)*

See that they are not poached: that water furrows, gutters, drains, and ditches are in repair; and where manuring is prac-

tised, cart it out in frosty weather where there is no danger of injury from the feet of horses or cart wheels. Unless labor is very cheap, carting earth or earthy composts on grass lands will not pay the expenses; they produce more effect on arable lands.

6. *Arable Lands. (4548.)*

See that all the modes of drainage are effective. (3937.) Plough and cart out manure according to weather and other circumstances.

7. *Fences (3767.), Roads (3280.), and Drains. (3909.)*

Plant hedges (3784.) and build walls only in temperate weather, as frosty air injures the roots of plants, and freezes humid mortar, thereby effectually preventing its setting. Roads and drains may be made and mended in all weathers that admit these operations.

8. *Orchards (3770.) and Hop-grounds. (5393.)*

Clear old trees of moss or mistletoe; but prune only in mild weather. Dig and dung at any time.

9. *Wood Lands and Plantations. (3627.)*

Fell timber or cope of sorts not adapted for barkings. (3740.) Stock or grub up tree roots, stacking them for fuel or charcoal. (3762.) Trench, dig, or otherwise prepare ground for planting; but lift plants from the nursery, and re-insert them in plantations only in mild weather, and when the soil does not parch by treading, &c. The rest as in November.

GENERAL INDEX.

N.B. *The Numbers refer to the Paragraphs, not the Pages, excepting in the case of the List of Authors, where they refer to the page and the year in which the Author published: in such cases the word page, and letters A. D. are prefixed.*

ABBATE, Antonio, his work on agriculture, page 1177, A.D. 1808.

Abadie, F., his work on agriculture, page 1173, A.D. 1791.

Abele poplar, the largest in England, 6986.

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